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TECHNICAL REPORT

MOLDOVA
Field Demonstration Site Selection Report

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Executive Summary

As part of the United States Government's program of assistance and cooperation with the Republic of Moldova, the Agency for International Development (USAID) is sponsoring a program of technical assistance, training, and the provision of equipment for environmental improvements. The purpose of this project is to address environmental concerns related to agricultural practices and provide an opportunity for the agricultural, ecological and public health communities to utilize modern concepts of risk decision making and, through cooperative efforts with improved technical capabilities, provide solutions for environmental improvement and address public health concerns relating to agricultural production.

In preparation for the program, up to three specific localities (sites) were to be identified that, with technical assistance and cooperation from the U.S., would provide tangible settings to demonstrate how changes in agricultural practices and technologies can reduce chemical contamination of water and alter the consequences on public health risk. Concurrent ERDMP case study exercises at 2 or more of the sites wouldl serve to demonstrate integratioin of effort among the agricultural, public health and environemntal protection communities. The demonstration sites would be situated in locations agreed upon by specialists representing the agricultural, public health, and environmental protection communities and who will jointly participate in the development and implementation of demonstration activities at the sites.

A process for selecting sites, including selection criteria was developed and implemented based on input from cooperating country counterparts, USAID/Kiev, and EPT/Moldova. Comment and input was solicited from the academic and scientific communities, the Ministry of Health, the Ministry of Agriculture, the Department of Environmental Protection, the Moldova Academy of Sciences, and the people who live and work in the various locations that were considered. Four site visits were made prior to final selection with the assistance of U.S. specialists in the fields of agriculture, water quality, risk assessment, and epidemiology.

Three sites have been identified and recommended for hosting various activities under the USAID-sponsored Moldova EPT program. They include: 1) the experimental farm of the Institute of Field Crops "SELECTIA" in Beltsy; 2) the joint-stock company (cooperative farm) "Moldova" in the Orhei Region; and 3) the joint-stock company (cooperative farm) "Prietenia" in the Cahul Region.

Moldovan counterpart participation in the site selection process was a critical first step in building broad-based support for the project, initiating a dialogue between the agricultural, health and environmental protection communities, and setting the stage for broader collaboration among these communities.

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Section 1

Introduction

1.1 Background

1.1.1 Agriculture, Environment and Public Health

Located southwest of Ukraine, Moldova has a population of approximately 4 million people and a land mass of approximately 3.4 million hectares. Agriculture is the country's primary industry with 51% (1.75 million hectares) of its territory under cultivation and an additional 205,000 hectares of vineyards.

Water resources are a scarce and valuable commodity in Moldova, and water pollution is believed to be one Moldova's foremost environmental problems. Environmental health risks have been attributed to the adverse impact of agricultural production on surface and ground water quality. Water and food contamination, resulting from the overuse of pesticides and herbicides on farms and vineyards and improper management of farm wastes, has been implicated in the deterioration of public health.

In addition to widespread concerns of contamination of water resources and foodstuffs, soil erosion is a critical environmental problem in Moldova and threatens the long-term sustainability of agricultural production and depletion of Moldova's greatest natural resource. It has been estimated that approximately 30% of all agricultural lands (over .5 million hectares) in Moldova have been severely affected by soil erosion and that 25 million tons of fertile soils are being lost each year. Because of asserted pesticide and other agricultural "chemical-loading" of agricultural soils, soil erosion is also believed to be a contributing factor in chemical pollution of surface water resources. Soil erosion has been accelerated by intensive agricultural production, deforestation, and, due to poor management and inadequate education, there is a general lack of appreciation for soil conservation efforts.

Many people in the NIS are now highly suspicious of the actual impact that traditional approaches to agricultural production has had on the general public's health. This sentiment is reflected in the assertions made by the public health community and in the intense debate between the agricultural sector and the public health sector as to the environmental costs of agricultural production to public health.

However, obsolescent collection and analytical techniques, for sampling and analyzing water, soil, and food stuffs, render most of the available environmental data unavailing and has limited the ability to adequately address environmental health issues related to agricultural production. Many of the assertions made, attributing health risks to environmental contamination from agricultural production, have been made without the benefit of supporting toxicology and human exposure data. In addition, management of environmental hazards and risks associated with agricultural production is extremely limited due to the lack of experience with innovative production practices and technologies, the inability to monitor and assess impact of risk management efforts, and a fragmentary and poorly organized (institutional)

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framework for risk decision making processes. More importantly perhaps, is the lack of collaboration between the public health, environmental protection and agricultural communities in exchanging information and data, discussing solutions and mitigation alternatives, and building consensus in the decision-making process.

Although not fully realized, environmental costs (both economic and health) represent a major constraint in the development of a viable agricultural sector in Moldova. However, there is a fairly large constituency of professionals, specialists, and officials within the agricultural community who are very sensitive to, and knowledgeable of, the adverse impacts that current agricultural practices have on the environment. This constituency recognizes the relationships between agriculture, natural resource preservation and protection, and public health and are seeking ways to address issues from a collaborative and integrated approach. There is an overwhelming sense that U.S. assistance and cooperation in demonstrating improved agricultural production practices will help lend credibility to the growing number of Moldovan agricultural specialists that acknowledge the importance of agricultural development for Moldova in the context of environmental protection and reducing risks to public health.

During Moldova's current transition to a market-based economy and democratic governance, there is a unique window of opportunity to introduce U.S. experience and technology and assist in helping Moldovan specialists demonstrate a common approach in the overall risk decision making process as applied to agricultural production, environmental pollution and public health interrelationships. The opportunity also exists for bringing specialists and decision-makers from the agricultural, health and environmental protection communities together to demonstrate the importance and benefits of an integrated approach in assessing and managing environmental risk associated with agricultural production.

1.1.2 USAID's Environment Project for Moldova

As part of the United States Government's program of assistance and cooperation with the Republic of Moldova, the Agency for International Development (USAID) is sponsoring a program of technical assistance, training, and the provision of equipment for environmental improvements.

The purpose of this project is to:

> **Address environmental concerns related to agricultural practices and provide an opportunity for the agricultural, ecological and public health communities to utilize modern concepts of risk decision making and, through cooperative efforts with improved technical capabilities, provide solutions for environmental improvement and address public health concerns relating to agricultural production.**

The Moldova Environment Project will foster linkages between the agriculture, public health, and environmental protection sectors through demonstration and cooperation. The project is designed to:

- Introduce common environmental decision making concepts to the public

health, agricultural and ecological (environmental protection) communities and improve laboratory skills and techniques for analysis of water;

- Establish field sites for alternative agricultural practices combined with valid laboratory analyses to demonstrate reduction in public health risk;

- Initiate a public education program that highlights relationships between public health, environmental contamination and agricultural production.

Project tasks have been organized into three main components, however, all three tasks are interdependent in terms of strategic planning, conceptual focus, and target audiences/localities (sites) with respect to project purpose.

Task M-I: Environmental Risk Decision-Making Process {ERDMP}

This task is the mechanism by which U.S. experience in the principles and methodologies of decision-making processes regarding environmental risk will be introduced. The target beneficiaries are the technical specialists and decision-makers within the agricultural, public health, and environmental protection communities. The task includes technical assistance and training, as well as the strategic provision of equipment that will support activities under demonstration activities (described below), and, will foster the development of indigenous capabilities in risk analysis and decision-making. By having representatives from the agriculture, health, and environmental protection sectors participate in this training, professional linkages will be forged and will form the basis for collaboration and consensus-building in the demonstration and educational outreach activities. This program will be aimed at ensuring that all three communities will be exposed to these concepts and will be able to discuss common problems and solutions and explore avenues of cooperation. This is an important step in initiating strong inter-community communication and establishing common goals.

Task M-II: Field Demonstration and Technical/Analytical Capability Improvement {FDTCI}

This task provides the tangible setting for:

- demonstration of improved production practices and techniques in agriculture,

- monitoring and analysis by agencies and specialists responsible for water quality and environmental protection

- initiating an ERDMP case study exercise at 2 locations with collaboration among the agricultural, public health, and environmental protection communities

- education, training, and public awareness initiatives for specialists, government officials and decision-makers, and the general public. .

This task will consist of establishing up to three field-based sites (localities), with technical

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assistance and cooperation from the U.S., to demonstrate how changes in agricultural practices and technologies can reduce chemical contamination of water and alter the consequences on public health risk. Concurrent ERDMP case study exercises at 2 or more of the sites will serve to demonstrate integration of effort among the agricultural, public health and environmental protection communities.

Concurrent establishment of a quality assurance chemical laboratory(ies) for analysis of water, will allow the availability of valid data for environmental risk decision making. The sites will serve as a focal point and delivery mechanism for concurrent technical assistance and professional training activities to improve analytical and monitoring capabilities for producing supporting data in the risk decision-making process.

Technical assistance and training in agricultural production practices and technology will be provided and tailored to Moldova conditions, and, which offer readily available and affordable options for preventing soil erosion and environmental contamination (primarily water pollution).

Through ERDMP case study exercises, the sites will serve to demonstrate collaboration among the agriculture, public health, and water resources sector specialists in addressing environmental risk at the local level and prioritizing and targeting appropriate risk management investments.

The sites will also provide a focus for community-based education and training activities (described in Task III) to help promote the adoption of technologies and practices demonstrated, and heighten public awareness of real solutions to environmental threats to public health.

Task M-III: Educational Outreach Campaign for Environmental Awareness and Consensus Building

A public educational program will be established, with representatives of the agricultural, ecological and public health communities, who, using newly acquired laboratory data, and technical skills and knowledge, will provide realistic information on risk estimates and risk management alternatives. Through the educational outreach program, public concerns that pertain to environmental contamination associated with agricultural production will be addressed and public participation in ERDMP will be fostered.

The educational outreach task will consist of a series of educational, training, and public awareness activities designed to foster application of information and experience gained by agricultural, public health and environmental protection technical specialists (under Tasks M-I and M-II). Each activity is designed to further strengthen linkages among these three communities and highlight the public sector's role in ERDMP. The activities will help to generate broad-based public support for integrated approaches to environmental protection and improve public access to information on environmental health issues related to agricultural production. Based on information assimilated and discussions held with representatives from the agriculture, health, environmental protection, and education sectors, a series of activities have been pre-identified that: 1) increases the number of direct beneficiaries of the project; 2)

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provides further mechanisms for collaboration between the agricultural, public health, and environmental protection sectors; 3) integrates other USG assistance program activities; 4) provides for application of skills and dissemination of knowledge gained ; and 5) fosters host-country initiative in extension of activities.

1.1.3 Field Demonstration Site Selection

Because the focus of the project is on environmental risk associated with agricultural production, it is critical to initiate, early on, discussions of technical and management improvements that can be introduced to the agricultural community and that provide alternatives to traditional practices. Although the relationship between current agricultural practices and risks to public health have not been fully substantiated, early provision of technical assistance to the agricultural sector, that focuses on environmental protection, will help identify individuals and institutions dedicated to environmental improvements in agriculture and ensure their participation when introducing concepts of risk decision making processes. In conjunction with the development of the risk decision making workshop and the water quality/monitoring and data analysis needs assessment, modern agricultural techniques and practices will be identified at this time. The focus will be on low-cost and no-cost techniques and practices that offer economical, as well as, ecological incentives for their adoption/integration into Moldova agricultural production systems.

In order to ensure that opportunities and avenues for cooperation are available and demonstrated, two or more localities will be identified to serve as tangible settings for introducing alternative agricultural practices that reduce environmental contamination (and, subsequently, environmental risk) supported by improved analytical capabilities. Thus, the beginnings of collaboration and cooperation among the agricultural, environmental protection and public health communities in the risk decision making process will be demonstrated, first hand.

These sites (localities) will also provide a setting for technical training in improved agricultural production techniques and practices, and in advanced water quality analysis and monitoring for the purposes of risk assessment and risk management.

The sites will also be utilized in initiating an educational outreach campaign on the relationships between agricultural production, environmental protection and public health. This will provide for a better educated public and will result in improved understanding of risks associated with agricultural production. With increased awareness of substantiated relationships between agricultural production and environmental risk, the public will be in a better position to participate in the risk decision making process.

This report on the site selection process and final selection of the demonstration sites, is one component of the overall project.

1.2 Purpose and Scope

The purpose of the site selection process and final selection was to establish up to three field-based sites (localities), with technical assistance and cooperation from the U.S., to

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demonstrate how changes in agricultural practices and technologies can reduce chemical contamination of water and alter the consequences on public health risk. Concurrent ERDMP case study exercises at 2 or more of the sites will serve to demonstrate integration of effort among the agricultural, public health and environmental protection communities. The demonstration sites will be situated in locations agreed upon by specialists representing the agricultural, public health, and environmental protection communities and who will jointly participate in the development and implementation of demonstration activities at the sites.

Concurrent establishment of a quality assurance chemical laboratory(ies) for analysis of water, will allow the availability of valid data for environmental risk decision making, initially focusing on the three sites. A strong emphasis of such a laboratory effort will ensure a sharing of these facilities and data by all three communities. The sites will serve as a focal point and delivery mechanism for concurrent technical assistance and professional training activities to improve analytical and monitoring capabilities for producing supporting data in the risk decision-making process.

Through ERDMP case study exercises, the sites will serve to demonstrate collaboration among the agriculture, public health, and water resources sector specialists in addressing environmental risk at the local level and prioritizing and targeting appropriate risk management investments.

Equipment and technology (both agricultural and environmental monitoring/analysis) that is demonstrated will primarily be in the custody of various research and technical institutions that are participating in the demonstration activities.

The sites will also provide a focus for community-based education and training activities (described in Task III) to help promote the adoption of technologies and practices demonstrated, and heighten public awareness of real solutions to environmental threats to public health.

1.3 Plan of Work

The site selection process was to begin in January following establishment of the Moldova Field Office. Preliminary meetings would be held with various cooperating country nationals (CCNs) and their affiliate organizations to determine how demonstration of improved techniques in agricultural production and how demonstration of ERDMP could be undertaken. A series of discussions and meetings would commence following the establishment of a Technical Advisory Committee in February. A preliminary list of potential sites and final selection criteria would be developed. Final selection would be made in conjunction with with the planning and design of the ERDMP workshop, case study exercise(s), and the field demonstration activities that would be undertaken by U.S. specialists, who would prepare plans and recommendations for structuring the demonstration activities and making technology/equipment needs recommendations over the three-week period.

Based on the site selections which would be finalized during the first week of the three-week planning and design visit, site visits would be undertaken to complete the subsequent sub-tasks. The approach is to focus planning and recommendations on conditions, resources,

issues and capabilities that are available at each site

In an effort to maximize impact and sustainability of the demonstration program, efforts will be made to secure the cooperation and participation of other donor organizations, other AID projects with relevance to the program (i.e. VOCA, PEACE CORPS, ISAR, and the NET), and enterprises representing the U.S. agricultural industry (both public and private).

Constraints and Deviations From the Scope of Work

Of particular concern is the time frame for the project. Because the project has been defined as a one-year effort, constraints are imposed on the types of equipment and techniques that can be introduced and demonstrated within the remainder of the calendar year (1995). Concerns were also raised regarding the limited time available in the current growing season to fully demonstrate improved techniques and practices for farm production systems. Consideration must also be given to the lag time between making recommendations for technologies and techniques and the actual delivery and introduction of the technologies.

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Section 2
Site Selection Process and Chronology of Events

In order to formalize, facilitate and document site selection, selection criteria was developed and organized into a site selection criteria form (Appendix 4). The selection criteria consisted of:

1. Physical Conditions (representative/typical for Moldova)

   1.a. geomorphology of the territory
   1.b. soil types
   1.c. climatic conditions (temperature, precipitation, growing days, etc.)
   1.d lithological/mechanical soil composition
   1.e main sources of pollution (point and non-point)
   1.f extent and severity of environmental degradation (of soil and water)
   1.g ground water resources and suitability for investigation

what benefit are we trying to achieve?

2. Social and Economic Conditions

   2.a. Type of farm (state-owned, private, joint-stock company, institution-owned) and size
   2.b Type of agricultural production (vineyards, orchards, grain crops, livestock, etc.)
   2.c Proximity to schools, colleges, other research institutions
   2.d Extent of public health services

3. Administration/Management and Logistical Capacity

   3.a. Existing technical/mechanical capability (farm machinery, irrigation equipment, storage, machinery/equipment maintenance,)
   3.b. Accessability (conditions of roads, available public transportation, etc.)
   3.c. Day and over-night accommodations (availability, capacity, and proximity to location)
   3.d Office space, meeting/conference rooms

4. who will benefit from demonstrations at this location and who are we demonstrating for?

5. how the host of each location will arrange for academic and research institutions to participate in, and have access to, demonstration activities at the location?

The following table summarizes the chronology of events pertaining to site identification and the selection process. Selection of specific sites became a complicated process due to political implications for selecting one site over another. The purpose of this table is to illustrate the complexity of the process and the effort to maintain consensus at each juncture in the selection

process.

Table 2-1 Chronology of Key Events in the Site Selection Process	
DATE	**EVENT**
January 25	J. Holderbaum met with M. Petrushevschi, Department for Environmental Protection. They discussed about the EPT Project in Moldova and she suggested several institutions, which could be involved in EPT activities, such as the Institute of Pedology, the Medical University of the Republic of Moldova, and the Moldova Sanitary Epidemiology Station. It was suggested that creating a committee represented by various Moldovan institutions would facilitate an efficient and successful planning process and implementation of the project.
January 27	J.Holderbaum met with A.Andriesh, the Director of the Institute of Pedology, P.Gusac, Moldova State Medical University, D.Siretseanu, Sanitary Epidemiology Station of Moldova to discuss the general scope of the EPT Project and solicited input.
February 3	The first meeting of the Technical Advisory Committee took place. The Technical Advisory Committee was established as the result of J.Holderbaum's meetings and discussions with representatives of different Moldovan institutions (initially referred to in a December, 1995 EPT Trip Report). The members of the Committee included: M.Petrushevschi, the Department for Environmental Protection, P.Gusac, Medical University, V.Cibotaru, the e Institute of Pedology, D.Siretseanu, Sanitary Epidemiology Center, B.Boinceanu, Belts "Selectia" Research Institute for Field Crops, G.Duca, Professor, Moldova State University, D.Drumea, Institute of Ecology and N.Opopol, Medical University. An overview of the EPT project for Moldova was presented and suggestions were to **establish Demonstration Sites in different regions of Moldova.** Sub-committees were established for agriculture, health, and water quality.
February 9	The Agricultural Working group met to discuss agricultural interventions and **several locations were proposed as possible demonstrations sites**: Tsaul (Northern region of Moldova), Girovo (central part), Lebedenco, Cahul, and Stefan-Voda.
March 15	Country-side trip with Boris Boinchanu , the Vice-Director of Belts "Selectia" Institute and V.Voineac, the Institute of Biological Protection of Plants for preliminary visit to several proposed sites. Based on discussions from the 2/9/95 Agricultural Working Group meeting, Dr. Boinceanu presented **criteria for site selection process**, proposing to chose 3 sites (in the North, Center and South of the Republic), which represent different climate and soil conditions. The sites proposed were: - Belts "Selectia" Crops Institute and Experimental Farm; - Orhei "Moldova" Joint-Stock Company; -Cahul, Lebedenco "Prietenia" Joint-Stock Company.
March 20	**Meeting with J.Osborn (USAID/Kiev)** and N.Gordienco (USAID/Kiev). Persons which participated: M.Petrushevschi, the Department for Environmental Protection, V.Voineac, the Institute of Water Problems, G,Duca, Moldova State University, D.Siretseanu, Sanitary Epidemiology Center, N.Opopol, Moldova State Medical University, B.Boinceanu, Belts "Selectia" Institute, V.Chibotari, P.Gusac and EPT Program Specialists: J.Berzan, O.Totrova, A.Totrov. **At the meeting the basic site selection criteria and candidate locations were outlined and received verbal approved by AID/Kiev representatives.**
March 21	J.Holderbaum writes an ACTION MEMORANDUM to EPT/Kiev and sends copies of that MEMO to EPT/WDC (Sandy Hale, Nancy Grossmann, Ben Stauss, Vladimir Karamyshevand Kate Hanlon). See Appendix 5.
March 21	J.Holderbaum, J.Osborn, N.Gordienco visited Beltsy "Selectia" Institute and met with B.Boinceanu and the Director of the Institute. The possibility of selecting the Institute as a site for demonstrations was discussed.
March 31	Technical Advisory Committee meeting to discuss the site selection issues.

Table 2-1 Chronology of Key Events in the Site Selection Process	
DATE	**EVENT**
April 3	J.Holderbaum met with M.Lupascu, a leading agronomist who is a Member of the Parliament of the Republic of Moldova, and Vice-President of the Moldova Academy of Sciences. They discussed EPT/Moldova activities, site selection process. Mr..Lupascu provided some helpful suggestions regarding the criteria of selection and political issues surrounding site selection .
April 5	Meeting of J.Holderbaum with Advisory Group: G.Duca, S.Andriesh, S.Fandofan, D.Siretseanu, N.Opopol, A.Capcelea. The meeting was also attended by John Jackson, Jane Berzan, Olga Totrova, Anatoly Totrov. Topic: Site Selection Criteria. **It was planned to visit 5 sites proposed during the March meetings with AID/Kiev representatives (J.Osborn and N.Gordienco)** (see attachment). The first site selection visit was scheduled for April 7 to Cahul.
April 7	Trip to Cahul (A.Totrov, O.Totrova, Opopol, Siristeanu, Voineac, Andriesh, Yalovitsky). Purpose: collecting information about the joint-stock company "Prietenia". Meetings with Mrs. Tamara Munteanu, farm manager and agronomist and other representatives of the farm.
April 14	Memo to the Members of Advisory Committee, Subject: Site Selection for EPT/Moldova Project and schedule of visits. (See Appendix 4)
April 19	Trip to Beltsy: J.Holderbaum, A.Totrov, O.Totrova, N.Opopol, D.Siretseanu, C.Ialovitsky, I.Bucinschi (Department for Environmental Protection). Meetings with Mr.Vronskii, Director of "Selectia" Research Institute and B.Boinceanu.
April 19	Trip to Orhei J.Holderbaum, A.Totrov, O.Totrova, N.Opopol, D.Siretseanu, C.Ialovitsky, I.Bucinschi. Meetings with Ion Hajiu - Chief-Agronomist, the Farm Manager and other representatives of the joint-stock company "Moldova".
April 21	Trip to Chetrosu : J.Holderbaum, A.Totrov, J.Berzan, I.Ungureanu, N.Stratan, Agricultural University, N.Opopol Meetings with V.Panteleev, the Director of the Experimental Farm of the Agricultural University and other local representatives. The Karagasan site was dropped from consideration at the request of the Advisory Committee.
April 22	U.S. Specialists arrive in Chisinau. They are briefed on the overall project and the sites that have been preliminarily identified. Discussions are held with the specialists regarding the merits of each site with respect to both agricultural and environmental risk issues. It is agreed that the specialists will focus efforts at the sites to be selected.
April 24	The members of Advisory Group presented sites descriptions, following the abovementioned criteria. Dr.Opopol presented 4 sites descriptions Dr.Boinceanu presented 4 site descriptions 3 different ? Dr.Andriesh presented 4 site descriptions Dr.Gavrilitsa -1 site description The consensus of the Advisory Group was that each of the four sites would be suitable for hosting project activities.
April 26	J.Holderbaum writes a memo to the Technical Advisory Committee members, announcing the final meeting of site selection for April 27. See Appendix 7. (At this point, EPT/Moldova with the support of the U.S. specialists plan to propose Cahul, Orhei, and Beltsy as the preferred sites at the April 27 meeting.
27 April	Advisory Group Meeting: Final Site Selection. 3 sites were agreed upon: Cahul, "Prietenia" Joint-Stock Company, Orhei, "Moldova" Joint-stock Company Belts, "Selectia" Research Institute for field Crops. Plans were made to visit the three locations during the following week. U.S. specialists specified the types of information that would be collected.

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Table 2-1 Chronology of Key Events in the Site Selection Process	
DATE	**EVENT**
May 2	Trip to Beltsy with US Consultants and Moldovan Counterparts: J.Holderbaum, O.Totrova, J.Berzan, I.Dumbrava, Z.Rumleanscaia, Z.Annau, H.Vandermer, Stokes, M.Decker, N.Opopol-SMU, V.Pynzari - PBPI. Meetings with: Selectia" Institute: Director- Vronskii M. and Dr.Boinchanu. SanEpidStation:: Director - Tsurcan Vasily, the Head of Lab - R.Archa; Central Veterinary Hospital Chief Veterinarian - V.Socolenco, Associate Veterinarian - I,Chiriac; Hospitals: Associate Director of Children's Polyclinic - P.Tricolici Associate Chief of Treatment Department - A. Cozub
May 3	Trip to Orhei with US Consultants and Moldovan Counterparts. Meetings with: AG JSC "Moldiova" Director- V.Negrutsa, Chief Agronomist I.Chadjiou Chief Engineer - T.Tricolici Veterinary Station: Veterinarian - A. Doros Hospital Chief Physician A.Tcaci SanEpidStation Head - C.Tighineanu
May 4	Trip to Cahul with US Consultants and Moldovan Counterparts Meetings with: AG JSC :Prietenia" Director - T.Munteanu, Agronomist - I.Vasilii, Head of Department of Services and Construction - G,Chitaniuc SanEpid Station Head - M. Crihan Head of Purification Water Analitical Lab - V.Timofeieva Technologist/Engineer - M.Volf, Chemical Engineer - T.Bezman Veterinary Sation : Chief-Veterinarian - P.Scutelnic Hospital Physician - M.Neamtsu Cahul Regional Hospital Administrative Center Administrator - N.Oglinda
May 12, 1995	U.S. consultants provide draft materials on planning/design for the ERDMP, and Field Demonstration components based on information obtained from the selected sites. Equipment recommendations were prepared for both agricultural interventions and upgrading analytical/monitoring capabilities in water quality.

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Section 3
Findings

3.1 Summary Descriptions of Sites Proposed by CCNs

An example of the type of input provided by various CCNs and cooperating country organizations based on the selection criteria outline is provided in Appendix 6.. Although 5 sites were formally considered in the final process, information was compiled on 4 of the sites. This information was reviewed by the U.S. Specialists involved in the program design phase prior to final site selection recommendations.

Most of the individuals who contributed information and comment on the proposed sites were familiar with at least 2 of the 5 original sites either through working at the locations or being familiar with the resources and conditions at the locations.

It is important to note that participation in the selection process by Moldovan counterparts was a critical first step in building broad-based support for the project, initiating a dialogue between the agricultural, health and environmental protection communities, and setting the stage for broader collaboration among these communities.

3.2 Background Information on Selected Sites

The following information was compiled by U.S. Specialists who participated in design and planning phase activities of the overall program. The information is organized into three sections based on the recommended sites, following a general discussion of the agro-climatic conditions in Moldova which played a critical role in the final selection.

3.2.1 Agro-Climatic Conditions of Moldova

Moldova is divided into three regions for the purpose of describing agriculture as it relates to geo-climatic conditions. (See Appendix 6). Geographically, Moldova's land mass is elongated and oriented from North to South and is approximately 450 km (about 250 miles) in length. With respect to climate, the northern region has approximately a 170 growing day season with 2800 - 3000 degree days (centigrade) during this time period; the central region has about 180 growing days and 3000-3200 degree days; and the southern region has about 185 growing days and 3100-3400 degree days. Soil temperature at 5 cm is 10 degrees centigrade beginning about April 16 in the North, April 12 in the Central region, and April 9 in the southern region.

The upper (northern) third of the country tends to have colder winters, a longer frost period, and annual precipitation of 500mm or more (most precipitation occurring in May, June and July). Very little irrigation is used in this region. Sugar beet is one of the principle crops in this region but there is also a significant amount of winter wheat, corn, and sunflower grown. Livestock production is also prevalent in the North and this region also has the greatest acreage of what could be considered as pasture land, although none of the pasture land throughout the country is improved pasture. The norther region also has a large percentage of

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the countries total fruit orchards.

The central region has a slightly milder climate but less overall precipitation and more problems with adequate soil moisture during the growing season. This region has more irrigated farm land than the norther region, particularly along the two major rivers that border Moldova on the East (Dnester River) and the West (Prut River). This region tends to be more susceptible to soil erosion (water induced). A substantial amount of the countries sunflower is produced in this region. Corn production is fairly extensive in the central region and there is also a significant amount of winter wheat grown. There is also a significant amount of vineyards in the central region, as well as, fruit orchards.

The southern region has the lowest amount of annual precipitation, averaging less than 300mm per year with typically heavy rains in June. This region is fairly susceptible to flooding and heavy soil erosion. There is a significant amount of irrigation in the extreme southern portion of this region, primarily for vineyards. Grain crops (wheat, corn), and vegetable crops are grown in this region, along with some sunflower. Livestock production is also prevalent here.

3.2.2 Agricultural Production Conditions at Selected Sites

Agricultural production practices in Moldova are fairly uniform across all cropping systems and production management schemes, regardless of location. Uniformity in production practices is indicative of the former command-control system of government that allowed for very little deviation from prescribed production practices. Comments provided here are applicable to all locations with only minor differences.

Production Systems and Management Practices. Most land used for the production of field crops is fall plowed and left with little or no crop residue on the soil surface to protect against erosion and soil moisture loss during the winter and early spring. Fields planted to field crops are predominantly rectangular in shape and are seldom arranged on the contour of the land. Thus, tillage operations are all too frequently oriented vertically on slopes.

With the exception of winter wheat and barley, most field crops, including alfalfa, are planted in the spring. Early spring planting (in narrow row spacings) of peas, oats and other cool weather crops provide reasonable cover to protect the soil against erosion during the high rainfall period from late April through June. However, row crops such as corn and sunflower are extremely vulnerable to erosion during this period since crop canopy remains open during most of the high rainfall period.

Orchards and vineyards are usually established (planted) on the contour of the land but most are clean cultivated between the rows. In most cases, hand hoeing is used to augment mechanical cultivation. The practice of clean cultivation between rows results in high susceptibility to soil erosion. In addition, roads and access alleys are most often oriented vertically to the contour of slopes and also contributes to intense erosion. Grass waterways, to divert excess water away from the contour strips to a protected water delivery zone are inadequate or non-existent in most cases.

Tobacco and vegetable crops are planted in rows without regard to contour and are susceptible to the same erosion pressures described above for row crops.

Livestock. Most large livestock production systems operate under confined feed lot management conditions where much of the feed produced some distance from the animal facility. High concentrate diets are frequently fed and these are also brought on-farm from distant points. Since crop land next to these large animal complexes is usually inadequate for spreading and recycling animal wastes into a crop-livestock system, there is a tendency for animal waste to accumulate and pose a threat to surface and ground water supplies. Because the people managing these large animal complexes do not manage the crop production operations that supply feed and forage, they do not recognize the value (nor necessity) of cycling animal waste through crop production systems. Therefore animal waste generated on large livestock complexes is viewed as a mere by-product of livestock production and expensive to dispose of.

Livestock belonging to farms that focus on crop production are usually grazed on community grazing lands. Because there is no control of access to these lands, overgrazing and mismanagement of the grazing lands is common, resulting in poor productivity. Overgrazing of lands not properly managed for pasture production has also greatly increased soil erosion under these conditions.

Tillage and Cultivation Techniques. Tillage and cultivation practices among crops vary widely. The primary tillage is usually done in the fall. Fields are left bare (without crops residues to protect the soil surface) and subject to erosion losses throughout the winter and early spring. Prior to planting soil is tilled and conditioned three or more times, and up to eight times in some cases, before planting in the spring. This system of soil preparation for planting results in very high fuel needs (costs), high losses in soil organic matter critical for maintaining soil fertility, high losses of soil moisture, and increased susceptibility to soil erosion by both wind and water.

Agri-chemical Inputs. As with most of agricultural production in the former Soviet Union, the remnants of a philosophy to maximize production and yields, at any cost, still exists in the agricultural sector. Pesticides were applied to crops without discretion and in enormous quantities. There is great reluctance on the part of the agricultural sector (particularly the government agencies and departments directly responsible for national planning) to admit errors in judgement were made regarding the indiscriminate use of chemical pesticides to achieve production goals. Today, due to poor economic conditions in Moldova, very few resources are available to purchase pesticides for agricultural production. Current conditions provide an opportunity to introduce and examine various alternatives to chemical pesticides for field crop production. Alternatives such as mechanical weed control, concepts of integrated pest management, and introduction of biological pest control agents are all suitable methods that could be demonstrated.

As with chemical pesticides, agriculture in Moldova has a legacy of intensive use of fertilizers in production systems. Natural soil fertility was rarely factored into fertilizer rates and timing of fertilizer application was not based on physiological needs of crops. An appreciation of the role of crop rotations in soil fertility management also did not exist. Nitrate leaching into

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groundwater and surface runoff has been a major problem in Moldova agriculture and has led to elevated nitrate levels in drinking water supplies. There is great concern of the impact that high nitrate levels has on public health. Also, because of poor management of soil under cropping systems, the natural fertility of many of the Chernozem soils in Moldova has been greatly depleted.

Demonstration of improved agricultural practices for improving soil fertility and optimizing scarce fertilizer inputs is highly desirable. Crop rotation schemes, utilization of cover crops and fallowing, improved planting techniques and irrigation regimes are some examples of the types of management and technical demonstrations that could be offered and assessed under Moldova conditions.

3.2.3 SELECTIA Institute Experimental Farm at Beltsy

The long-term experimental research work which has been, and is still being, carried out on the fields of the Scientific Research Institute of Field Crops for more than 30 years on crop rotation, soil treatment and the use of manure, prove that there is real potential to decrease the chemical treatment of plough lands, which could ensure significant decreases in environmental pollution and public health risks.

Since the fall of 1994, the agricultural systems department of the Scientific-Research Institute of Field Crops has been carrying out a comparative assessment of the energy consumption, financial expenditures and environmental risks deriving from improvements made to agricultural systems in Moldova. The data obtained gives an ample assessment of different crop rotation systems, fertilizing and new soil protection systems.

The American system of soil protection can be tested on a long-term basis through statistical experiments. The field-based experimental farm is situated on a hillside with a steepness of five to seven degrees. The research carried out on the farm fields is a part of a complex annual investigative programs aimed at checking the agrophysical, agrochemical and biological indices of soil richness and fertility in many field and laboratory tests, carried out by specialists of the agricultural systems department and several other related departments.

The Scientific-Research Institute of Field Crops has a highly trained tractor and field-crop cultivation team, capable of carrying out all the necessary field work both on the farms and during production tests in the most efficient and timely manner possible.

The specialists of the agricultural systems department have been carrying out scientific and research work, as well as practical work on the Moldovan Steppes. The Scientific-Research Institute of Field Crops is well known for its work on selection, seed growing, and major field crops cultivation technologies which have been widely applied on Moldovan fields and in other republics of the former Soviet Union.

Annual demonstrations are carried out on the experimental fields of the Institute, at which specialist from all parts of Moldova study the new selection works on different field crops and

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new technologies. We consider the demonstration of US experience in ecologically and economically sound agricultural production practices highly desirable and important. It can be done on the fields of the Scientific-Research Institute in Balti. Not far from there, are the North-zone agro-chemical laboratory, equipped with all the necessary modern soil-, crop- and water conditions testing equipment, The Sanitation and Epidemiological Center, a regional branch of the Environmental Protection Service, and the largest Medical Treatment Center in northern Moldova. All of these organizations can play an active role in the project.

The Balti Scientific-Research Institute of Field Crops has experimental plots of land in addition to the fields of the experimental production farm which can be used for various demonstration needs.

Agricultural Conditions. Selectia is conducting rain-fed trials on tilled land with and without fertilizer. Trials are being conducted on continuous crops and various fertilizer and livestock waste applications. During the last few years, irrigation has become a part of the research work. At another site, Selectia is working on crop rotations and combinations of crops like vetch and rye. By rotating small grains (wheat, rye, and spring oats), row crops (sugar beets, corn, and sunflower) and legumes (alfalfa and vetch), they are able to reduce the use of environmentally harmful fertilizers and pesticides.

Due to the lack of combination tools, there are still 5-10 equipment trips over the fields between crops. This results in high fuel costs and soil compaction. The existing machinery is also designed for use on tilled fields, not for use with crop residues or cover crops. Zero-till is not being practiced at this time. Workers at Selectia are aware of soil loss problems, but the equipment that is available is not designed for Zero-till.

why, because of runoff?

Animal waste from the adjacent dairy operation at Selectia is used for trials and production agriculture but, because of equipment constraints, the manure cannot be fully utilized. With soil tests and analysis of livestock waste it can be a valuable source of crop nutrient and organic matter (OM). However, currently workers use manure only after it has lost most of its nutrients from being left in stock piles for several months.

At Selectia there is an understanding of integrated crop management (ICM). The workers there want to try new options in agriculture which focus on efficiency and environmental sustainability. This desire, along with the addition of some equipment, computer technology, and worker protection training will help Selectia teach farm operators, students of all ages, and the general public about the improvement in agricultural production, an agricultural design to protect the environment, and public health while still allowing for the production of affordable food.

Public Health Problems. According to the information, provided by Dr. Patricela Tricolici, Associate Director of the Regional Hospital Pediatric Clinic and Dr. Cozub Ariadna, Associate Chief of Treatment Department, in children up to 7 years old more than 50% of admissions are upper respiratory diseases (pharyngitis, bronchitis). Last year, 440/1000 cases were respiratory but only 45 cases were pneumonia. There were 5/1000 cases of viral hepatitis and 3.8/1000 of dysentery and 2.8/1000 of gastrointestinal diseases

In children up to 14 years of age there were 490/1000 cases of respiratory diseases; 2.8/1000 cases of pneumonia; 1.4/1000 of salmonellosis; 6.7/1000 of gastrointestinal disease of

unknown etiology and 7.2/1000 cases of viral hepatitis. Morbidity was estimated at 2000/1000 cases per year.

The incidence of neonatal morbidity was 20-25%. These cases were attributed to:
1) intrauterine hypoxia (70% of the morbidity);
2) 5-7% bilirubinemia (hemolytic);
3) 7% bilirubinemia (other etiology);
4) 6.4% birth trauma;
5) 0.5 sepsis;
6) 2% genetic malformations.

These neonatal abnormalities (genetic) increase up to 10% if all other abnormalities are included up to 7 days of age. Mortality associated with malformations is 4.2% up to 1 year of age and appears to be increasing.

The intrauterine hypoxia was described as being associated with anemia, a commonly diagnosed condition in Moldova amongst pregnant women and children. Dietary factors were given as the cause (up to 50% of the cases of intrauterine hypoxia), particularly in the winter, when few fresh green vegetables are available. There appear to be inadequate prenatal care services available in the region. There also may be some problems with alcohol abuse, but no specific numbers were available and it was not considered to be a major factor.

Methemoglobinemia cases were rare, with only 5-6 cases per year. Mortality associated with leukemia was 3-4 cases per year and cancer only 2-3 cases per year. These unusually low numbers may be due to the fact that cancer cases were treated at the cancer hospital rather than the children's hospital in the region.

Water Systems. According to Mr Turcan, Chief Doctor of the Center for Hygiene and Epidemiology (CHE) in Beltsy, drinking water is partially supplied to Beltsy from the Nistru River via the purification plant in Soroca. This plant was placed into operation in the early 1980s and resolved a major problem for Beltsy, which previously relied only on local wells. Currently, the Soroca supplied drinking water is supplemented by twenty-six (26) deep drilled wells that are hermetically sealed.

Samples are taken and analyzed from 12 points of the Soroca supplied water three times per week. There are also 565 private shallow wells in the City of Beltsy. The rural areas have a separate and decentralized drinking water supply system, reliant entirely on private shallow wells and all hospitals and schools use only the deep drilled well water. Mr Turcan explained that up until 1993, the Vodokanal, regulated by the Ministry of Communal Services in Chisinau, was the entity responsible for drinking water analysis. Two years ago, the Vodokanal was relieved of that responsibility and the CHE took over the sampling and analysis of drinking water.

Laboratories. The CHE water analysis laboratory in Beltsy is headed by Ms. Raisa Archa. There is an estimated 3000 square feet of laboratory space for water analysis. It was reported that the laboratory analyzes water for nitrates, nitrites, fluoride, iron, copper, sulfates, chloride, zinc, turbidity, hardness, color, taste, and coliform indices as well as pesticide content. Analyses are performed via wet bench techniques with determinations made via volumetric, gravimetric, and colorimetric techniques.

GOST manuals were presented in response to all questions regarding SOPs and/or QA/QC procedures. The daily estimated number of water samples analyzed were reported as 0 to 12 per day. Distilled water is used for blanks and the preparation of standards. A standard procedure for receiving samples and processing them through the laboratory is utilized. Data is recorded into lab notes books and final data sheets are prepared and shipped to CHE headquarters in Chisinau.

There is a recent Russian made gas chromatograph, identified as Model name Crystal 2000. The GC is interfaced with a computer. Nitrogen is the carrier gas and they have two columns. The GC is used to perform pesticide analysis. Other equipment observed in the lab included pH meters and selective electrodes and a spectrophotometer. They stated that they would like to have an atomic absorption spectrophotometer. They would like to have portable equipment for field tests such as pH, total dissolved solids, conductivity, etc.

Three people are employed in the laboratory: one has a medical doctor degree and two have college degrees in medicine and are laboratory assistants. The people who perform sampling receive special training. The prime method of preservation of samples appears to be keeping the samples cool and getting them into the laboratory as quickly as possible for analysis.

The laboratory benches were clean and free of encumbrances and the lab was well organized. Their reagents were recent and were within shelf life. No Material Safety Data Sheets were presented as being available to employees. There is no monitoring program for contamination in sample storage. However, samples are kept separate from standards.

Samples are discarded into the sink upon completion of analysis unless unusual results are obtained, whereupon the samples are retested and if confirmed, CHE headquarters are requested to give instructions as to what additional steps are required. Blind performance evaluation standards are not adhered to in this laboratory. The lab cleans and recycles its glassware and sampling containers.

The microbiology laboratory had large UV purification rooms for bacteriological work. The technical personnel were not knowledgeable of any analysis for enteric viruses. They perform only bacteriological work.

Reference was made to the analysis of water samples for the industrial enterprises, for which the laboratory is compensated. It was also noted that in addition to water analysis, the laboratory performs analysis of food products. All food products that are made in Beltsy or imported into Beltsy are analyzed in this laboratory.

source?

As recently as the end of April of 1995, the CHE had taken on the responsibility of sanitizing the 565 private dug shallow wells that are located within the City. Two hundred thirty-five (235) of the 565 wells had been sampled and analyzed and were found to contain high levels of fecal matter and were therefore sanitized with chlorine. In addition, nitrate and nitrite levels of 300 ppm to 400 ppm have been reported. Of the 565 private wells, not all are for the sole purpose of residents. Some belong to the industrial enterprises, some are on the premises of institutions, and some are on the streets for communal use. It was confirmed that wells with the highest levels of contaminants were those of the industrial enterprises.

The head chemist, Ms. Raisa Archa, at the Beltsy regional CHE, provided her laboratory book

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with data on analysis performed. No nitrate or nitrite levels were observed that exceeded 50 ppm. Ms. Archa stated that in 1994, 106 private wells and 96 samples from the Soroca treated water supply had been analyzed for pesticides. Specific pesticides analyzed for, according to Ms. Archa, were chloro-organics, phospho-organics, triazine, copper sulfate and triamine. She reported that no pesticides were found. She stated that copper levels of 0.06 to 0.08 ppm had been determined in lakes and rivers near by.

3.3.4 Joint-Stock Company "Moldova" at Orhei

Agricultural Conditions. The joint-stock company in Orhei has been producing various crops, mostly grain, alfalfa, tobacco, and vegetables. Recently and on a small scale they began growing grapes, and orchard crops and increasing vegetable production. They are increasing their livestock numbers and changing their farming practices and field layout to accommodate crop rotations and conservation. The production farm is located on land which is typical of Central Moldova. Chisinau Scientific Research Institute, in cooperation with the Institute of Plant Bioprotection and the Institute of Fruit-Growing, has started working on making this farm a model demonstration site. .

Orhei management is in the process of changing to a rotation that includes more legumes and small grains both of which will reduce soil and water losses. They are using alternatives to plowing but, because their machinery is not able to plant in crop residue, they must make 5-8 trips over the fields to be able to plant in what little residue is left after the tillage operations are completed. The residue remaining after this many trips with a disc is only slightly more than plowing would have allowed. The soil structure, soil moisture and fuel cost combine to make this an expensive and not very effective form of conservation tillage.

Perennial crops and vegetables are of increasing importance to Orhei. They are handicapped by machinery requiring large numbers of laborers for planting vegetable and tobacco seeds. By rotating the crops, fewer pesticides are required. Manure is used but not to the extent possible because of a lack of understanding of its fertilizer value.

Pastures are not managed but do not seem to be overgrazed. However, as livestock numbers increase, the pressure on the pastures will increase. Since the pastures have not yet deteriorated, improvement and management will be easier.

Irrigation was not discussed at Orhei. Management is in the process of reorganizing their field and land arrangement to allow crop rotations and soil conservation practices. Surface drainage waters are being stored for irrigation purposes and plans have been drafted for planting more tree belts for windbreaks.

Public Health Problems. Mr. Anatoly Tkach, Chief Physician of the Hospital in Joint Stock Company "Moldova", indicated that, in the past 18 years, it has registered only one case of acute pesticide poisoning. He believes that the principal health problem associated with pesticide applicators is liver enlargement and some spleen enlargement.

In the general population, there were 3 cases of viral hepatitis (in all cases associated with private wells). Due to the high fluoride content of the water in the area, there were many cases of tooth discoloring in children. No cases of methemoglobinemia were reported. In fact according to Dr. Tkach, health in children has improved in the past 6 years because of reduced

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pesticide applications. Anemia, however is a growing problem, partly because of "bad cultural" habits in nutrition. Health awareness however, has increased after the Chernobyl disaster in the population.

There were no congenital malformations in 1994 (about 120 births) and in a new family planning center, pregnant women are examined for health problems and counseled on alcohol consumption.

The rate of cancer (unspecified) has remained stable over the years, and there was a greater incidence in women (breast and uterine) than amongst men. There were two cases of thyroid cancer in adults in the previous year.

Water Systems. Orhei is located approximately 60 kilometers north of Chisinau. There are approximately 133,000 people within the Orhei region. In Orhei, Mr. Tighineanu Constantin, Chief Doctor of the Regional CHE office provided information on the area.

Mr. Tighineanu stated that there are approximately 72 villages within the Orhei region. The municipal drinking water is supplied by one spring that is stored in a tower reservoir and 16 deep drilled wells that are stored in two other tower reservoirs. Water from all three towers are mixed prior to distribution to the city. Fifty two pipe lines are routed from these reservoirs to the city. He stated that the people in the region prefer their own shallow dug wells. There are some 2000 such wells in the region. Only 20 shallow dug wells are within the city. All city wells are inspected once per month and rural wells are inspected much less frequently.
He stated that the bacteria content in the shallow wells is very high. In addition, there is a shortage in the amount of water available and water can not be provided on a continuous basis. Breaks occur frequently in the distribution lines and because there is not a continuous flow, contaminants migrate into the lines. Nitrate levels are always well above the GOST standard. Mr Constantin stated that they need help to sample, analyze and purify the shallow dug wells.

The municipal drinking water is supplied by one spring that is stored in a tower reservoir and 16 deep drilled wells that are stored in two other tower reservoirs. Water from all three towers are mixed prior to distribution to the city. Fifty-two pipe lines are routed from these reservoirs to the city. In addition to these supplies, drinking water within the city is supplemented by 20 shallow dug wells. There are some 2000 shallow dug wells throughout the region.

At the village of Sirota, just out side of the City of Orhei, water is supplied to the collective farm by two deep drilled wells and one spring. The well water is pumped to a holding tower, the capacity of which was not provided. Water from the spring is routed to a "mechanical station" which was assumed to be the location of the holding reservoir for the spring water.

Water lines are routed from the reservoirs throughout the farm and water is distributed to the farm tenants via these lines. The deep drilled wells and the spring water are monitored by the CHE.

Laboratories. The floor space of the water quality laboratory was estimated to be approximately 2500 square feet. The laboratory was clean and organized and there was adequate work space with unencumbered benches. The chemical analytical lab is staffed by 3 doctors and 5 lab assistants. The bacteriological lab is staffed by 3 doctors and 12 lab

assistants. However, not all personnel work at the same time. The head of the laboratory stated that the reason their staff is so large is to accommodate leave of absences taken by both pregnant mothers and mothers with small children. The amount of compensation paid to staff could not be determined. Unfortunately, no photographs were taken of this laboratory, however, the layout almost replicates the lab in Beltsy with the exception of not having the number of UV purification rooms. The laboratory does not have a formal training program for personnel. There are no QA/QC policies or procedures as practiced in western laboratories and the GOST is referenced with the same biblical reverence as the standard for all aspects of the laboratory.

Analysis of water is performed to determine the levels of nitrates, nitrites, fluoride, iron, copper, sulfates, chloride, zinc, turbidity, hardness, color, taste, and coliform indices as well as pesticides. Wet bench methods are used and many determinations are made via volumetric, gravimetric and colorimetric analysis. The lab had a Russian made GC (Model Crystal 2000) with a PID detector that appeared to be fairly new. Nitrogen is the carrier gas. {It is noted that throughout Moldova, the carrier gas is imported from Kiev.} The head chemist appeared knowledgeable of her work and expressed an interest in learning more about internal control methods and pre-screening of samples to access contamination levels.

While at the Agricultural Joint Stock Company "Moldova", Orhei Region, Dr Siretseanu sampled two deep drilled wells, a water tap within a school, a yard tap and two shallow dug wells.

The process for taking samples was lax and noticeably lacking controls. The samples were placed in random glass containers and left sitting for 5 and 6 hours respectively before they were taken to the lab to be tested. No chain of custody was used. No record was made as to climatic conditions {it was raining} or date or time. No labels were affixed to the sample container either before or after sampling. The second well was sampled in the same fashion as were the taps. Clear glass containers were randomly selected as well as amber containers.

When sampling of the shallow wells took place, samples were obtained by bailing the water with the attached well bail bucket. The bucket was not emptied of its contents or rinsed several times with the well water prior to pouring the sampled water from the bail bucket into the sample containers. It is clear that more strictly controlled sampling techniques could improve reliability of data substantially.

3.3.5 Joint-Stock Company "Prietenia" at Cahul

Agricultural Conditions. A tour was made to the Joint Stock Company "Prietenia", village Lebendenco, Cahul Region. The farm director, Ms. Tamara Muntianu, and Mr Chitaniuc Gavriil, Head of the Department of Services and Construction on the farm stated that the water in some sections of the farm was very high in nitrates. The Village of Ursoia was specifically noted as having water with high nitrate levels. This information correlated with data observed in the laboratory in Cahul. The joint-stock company in Cahul has a fairly diversified production system, producing a variety of grain, vegetagle and fruit crops. Their soils are variable and erosive. Irrigation with swine, waste water and some river water is conducted on some fields, but water quality is poor. There is also a lack of water at present but there was a plan a few years ago to divert Danube water into the area. It is doubtful that this will happen in the near future if at all.

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Perennial crops are not irrigated. They are clean-tilled, causing excessive evapotranspiration and erosion. Erosion is a particular problem in some of the vineyards. Manure/waste disposal is a problem because of sodium salts and the lack of high quality irrigation water with which to dilute waste water.

At Cahul, pastures are on former vineyards, which were terraced, and very steeply graded slopes. The erosive soils combined with low rainfall and overgrazing create excessive soil and water loss due to compaction and lack of vegetation. Land management in the form of field rearrangement is being practiced on the farm. However, although there are windbreaks and ponds, there are no terraces or grass waterways.

Management in Cahul are aware of the environmental issues and are interested in changing their operation. Their focus is on increasing yields at current input levels in order to increase profits.

Public Health Problems. At the Region Hospital Administrative Center Dr. Nicolai Oglinda shared the following data on this region: most common disease categories are liver cirrhosis as well as viral hepatitis. Since 1990, an immunization program has reduced incidence of hepatitis. Dr. Oglinda showed the results of a study that evaluated the effect of water pollution on liver disease. Group 1 used water from the Prut river that was treated and distributed by the city. Group 2 used Prut river water for irrigation only. Group 3 did not use Prut river water. The highest incidence of liver diseases were in Group 1 indicating that the normal purification processes do not remove viruses from the water supply. Dr. Oglinda also attributed some of the liver disease problems to the extensive use of pesticides since the 1960's.

According to Dr. Oglinda, 76% of births have some form of pathology associated with them, primarily affecting the mother. There were only 2-3 congenital malformations per year in the region. Anemia was a common problem, with 368 cases in 1994 (hemoglobin content of less than 100/liter). Diet, "living conditions", and possibly digestive diseases were thought to be possibly associated with the anemia. In addition, no vitamin supplementation was available in the region.

According to Dr.Maria Niamtsu, Therapist from Lebedenco Policlinic(Joint Stock Company "Prietenia", Cahul Region), the most common diseases among the population served by this clinic (it is 7000 in 3 villages) are cirrhosis and hepatitis. 80% of cirrhosis cases, according to her, are related to hepatitis and living with so many chemicals; 20% may be related to alcohol. In 1993, 6 patients with cirrhosis died, equalling the average rate in the region. There seemed to be an equal number of men and women succumbing to this disease.

Generally, there are few heart disease cases. Cancer accounts for another 6 cases, of whom 4 have died. Most cancer cases seem to be either of the heart or stomach. Lung cancer is rare. All residents in the region are examined yearly by fluoroscopy above 16 years of age, primarily for evidence of tuberculosis and also for lung cancer.

Approximately 100 children are born each year in the three villages. Congenital defects and methemoglobinemia are rare. Moreover, the data provided by the Ministry of Health in Chisinau, indicated a case rate of 90/1000 for Cahul, ten fold higher than the national average. Because nitrates in the wells are 3 times above maximum permitted norms, children are given

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cow's milk.

Water Systems. Mr. Crihan Mihail, Chief Doctor of CHE provided a site visit and information on the Cahul water purification station. As is the case in Chisinau, there is no prechlorination that takes place as water enters the purification station. The water is first mixed with $Al_2(SO_4)_3$ for flocculation. In the second stage, sediments fall out and prechlorination takes place. {It is noted that the purification station is very low on chlorine}.

The water is then routed to the sand and crushed cellulose filters. The plant personnel stated that sometimes activated charcoal filters have been used. The water is then routed to three reservoirs located at the pump station. In the eastern part of the city, there are several captages that are pumped to a reservoir, chlorinated and mixed with water in the three reservoirs prior to being routed into the city of Cahul. In addition to this treated water, the city is also served by 50 shallow dug wells. The total water available is inadequate for the city of Cahul and there is no continuous supply of water.

The sources of water for the farm were identified as two deep drilled wells and four captages. Each deep drilled well has its own separate water tower. The lines after the water tower carry water to their respective locations where water service is provided via taps to the streets and to the yards. The school has taps that go inside the building.

There are four "captages". The translators interpreted the term "captage" to be a spring. Three of the captages are in the Village of Lebendenco and one captage is in the Village of Ursoia. {Note: the Village of Ursoia is where the CHE lab reported high nitrate levels [50 mg/L to 600+mg/L] earlier during the visit to the lab}. The captages are described as ground water wells approximately 10 meters in depth.

According to Mr Chitaniuc, ground water flow is north west. The water lines are a 2-pipe system; one pipe carries water to the water tower and the other pipe carries water back for distribution; however, it is noted that some of the consumers tap the line en route to the water tower. It was not made clear as to why this occurs. Captage #3 is apparently a "perched aquifer." This captage is being depleted. The piping for this captage runs 12 kilometers. It is noted that perhaps concerns about dwindling water supplies are in part based on this perched aquifer.

Laboratories. The CHE laboratory in Cahul was certified on April 6, 1995 (no information as to the certifying entity was provided). Equipment in the laboratory consists of colorimeters, pH meters and ion specific electrodes for fluoride and nitrite analysis. Approximately 30 to 50 samples are analyzed each week. Samples are obtained from points along the Prut River and from the Cahul treated water supply.

Laboratory personnel include two doctors and four college-trained medical technicians. The laboratory staff appear to be competent and knowledgeable. Something similar to a chain of custody is used and accompanies samples to the laboratory. Results of analysis are kept in laboratory notebooks and final reports are prepared by hand and sent to Dr. Siretseanu in Chisinau. Routine analyses are performed on private hand dug wells as well as the treated water supply. The laboratory needs standards and reagents. A spectrophotometer in used in the lab. It is assumed that the lab performs analysis using lab methods similar to those in other CHE labs, namely volumetric, gravimetric, and colorimetric determination methods.

A tour was made to the laboratory at the Cahul water purification plant. The tour was led by Ms. Timofeeva Valentina, Head of the laboratory. The square footage of the analytical water lab is estimated to be approximately 2500 ft^2. The laboratory was impressive clean and well organized. There was adequate work space and benches were unencumbered. Two people are employed in the chemical analytical lab, name Ms. Timofeeva and Ms. Tatiana Bezman, Chemical Engineer. Two people are employed in the bacteriological lab, one of whom is Mr. Michail Volf, Technologist and Engineer. The lab does not have a formal training program for personnel, but there is little employee turnover and the technical people are well versed in the methods and techniques that they use. There is no QA/QC policy or program as is exercised in western laboratories. The GOST standard followed serves as the SOPs for the lab.

The laboratory analyzes water samples from two points within the purification station: one is performed on the Prut River water as it enters the plant, and the other is performed on the reservoir water after purification. Water samples are tested for levels of nitrates, nitrites, ammonium, pH, chloride, iron, sulfate, aluminum, turbidity, hardness, residuals, taste, odor, color and fluoride. However, fluoride testing has not been performed for some time because they no longer have a functioning fluoride ion electrode. Wet bench chemistry methods are employed and determinations are made using volumetric, gravimetric and colorimetric methods.

Equipment in the lab included a spectrophotometer, colorimeters and pH meters and ion specific electrodes. This lab also uses a thin layer chromatography technique followed by UV detection to qualitatively detect pesticides.

The laboratory cleans and recycles its glassware. The technicians take samples and have a specific protocol to follow. GOST is the identified source for SOPs, QA/QC, and maximum allowable concentration levels. Samples are disposed of into the sink upon completion of analysis. Samples and standards are stored separately. Distilled water is used for blanks and for the preparation of standards when standards are not available.

Laboratory personnel expressed satisfaction with their present equipment if parts could be obtained. They stressed the need for ion specific electrodes as well as standards and reagents.

The bacteriology lab performs coliform indices and is in desperate need of special membrane filters for bacteriological determinations. They estimate that, based on their volume of analyses performed, 1000 membrane filters per year would adequately meet their needs. They stated that they believed that all of the purification station laboratories were in need of similar supplies.

In summary, the findings obtained from meetings with Moldovan experts reiterated the presence of copper sulfate, nitrates, pesticides, and fecal materials in Moldovan drinking water supplies. In some areas, the treated water supplies are inadequate to service the entire population. Breaks in distribution lines are a common occurrence and in areas where the water supply is inadequate, continuous water flow is not provided.

As a result, migration into distribution lines is facilitated when breaks occur. The meetings also revealed that surface waters may be impacted to some extent by industry along the Nistru and Prut Rivers. Moldova, at one time, produced military equipment which resulted in heavy metal containing waste. The chemical and metallurgical industries along the major rivers may have

impacted the environment. However, the Moldovans do not have the equipment/instrumentation to analyze the water for potential contaminants from these sources.

Section 4
Conclusions and Recommendations

The three sites identified for program focus collectively provide a unique opportunity to demonstrate both improved agricultural production practices for environmental protection and integration of the risk decision making process across disciplines (agriculture, health, and environmental protection).

From a geographic standpoint, the three sites are representative of the three agro-climatic zones of Moldova which will be critical for demonstrating and evaluating the applicability of production practices and techniques that are to be introduced for all of Moldova. The strategic location of these sites in the north, central and south of Moldova will also foster greater participation in the overall program and support at the national, regional and local level.

The Beltsy site will provide a controlled setting for evaluation and adaptation of improved agricultural production practices and foster extension of improved management techniques, first through the cooperating Joint-Stock companies and then to the broader farm community. SELECTIA institute will also provide the setting for some of the technical training, educational field tours, and practical training seminars. Relations between the Institute and the regional CHE and Department of Environmental Protection are very good and will foster collaboration in demonstrating a common approach to environmental risk decision making processes.

The Orhei site is strongly recommended due to the progressive attitude of the farm management, the demonstrated intent to seek the technical support and recommendations of the agricultural scientific community, and the willingness to make the farm available for public scrutiny with respect to environmental improvements and protection, and, to make the farm available for demonstrations and studies to be conducted on behalf of various agricultural research institutes. From a public health standpoint, regional agencies and services are committed to cooperating in the demonstration activities to promote improved assessment and management of environmental risk.

The Cahul site is perhaps the most critical location in terms of overall program objectives as it is representative of what is perceived to be a high-environmental risk region of Moldova. The farm manager, Tamara Muntian, is a very dynamic and influential leader in the agricultural community. She recognizes the concerns on behalf of the health and environmental protection communities and is very willing to assist in both demonstrating and promoting improved production practices and management to address these concerns and to host investigations in environmental monitoring. Very good relations exist between the farm management staff and the local health and environmental protection authorities. The farm also has excellent relations with various research institutes and is currently collaborating with the Institute of Pedology and Soil Chemistry and the Institute of Biological Protection of Plants--two of the principle cooperators in the overall program.

Appendix A

Memo to Technical Advisory Committee (1/30/95)

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ENVIRONMENTAL POLICY & TECHNOLOGY PROJECT
A Project Financed by the United States Agency for International Development
Serving Countries of the Former Soviet Union
Managed by CH2M HILL International Services, Inc.

Ukraine, Belarus & Moldova Regional Office
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memorandum

To: Marshall Fischer -- USAID/Washington
From: Ties van Kempen
Date: 7 Jul 95
Re: Preliminary draft of Moldova site selection report

Per our telephone conversation on 6 Jul 95, enclosed please find a preliminary draft of the document *Moldova Field Demonstration Site Selection Report*, prepared by Jim Holderbaum.

This report has not yet been edited or reviewed by management of the EPT Project, but is submitted to provide USAID with an initial understanding of its content and major findings. We would welcome USAID's comments on this preliminary draft.

tvk:memos95\memo43.95

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
MOLDOVA FIELD OFFICE
Chisinau, Moldova 277012, str. 31 August, 98 #411
Telephone/Fax: (373-2) 24-87-62

A USAID Project Consortium led by CH2M HILL

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

MEMORANDUM

DISTRIBUTION: Margareta Petrusevschi, Pavel Gusac, Valentin Chibotari, Dimitri Siretsanu, Boris Boinchan, Giorge Duca, Dumitru Drumea, Nikolai Opopol

COPIES: Ties van Kempen, EPT/Kiev
Susan Sutton, AMEMBASSY/CHISINAU

FROM: James Holderbaum, Program Manager/Moldova

DATE: **January 30, 1995**

SUBJECT: Initial Advisory Meeting

I would like to convey an informal meeting at 11:00am on Friday, February 3, 1995 at our Project Office, Room 411, str. 31 August, 98. The purpose of this meeting is to discuss the objectives, scope, and implementation requirements for USAID's Environment Project for Moldova and to listen to your comments and ideas on how to plan and conduct this project. I must stress that this meeting is informal and will serve as a starting point for developing the overall project. I value your opinions and expertise and hope that you will be able to attend to share your ideas and knowledge on the subject of environment. As I have explained to most of you, USAID desires a program that is oriented towards tangible results that will be achieved within the year and I would like to begin implementation of the overall program as quickly as possible.

Attached is an AGENDA that outlines the schedule for the meeting for your review. If you have any comments on the agenda, please send them to me at your earliest convenience. The meeting is scheduled for 2 hours and I plan to conclude the meeting on time. I look forward to meeting with all of you on Friday.

Regards, James Holderbaum

Attachment: a/s

USAID

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11:10 - 11:30	- Provide overview of USAID's Environment Program for Moldova
	- scope of program
	- organization
	- implementation issues
	- program parameters/constraints
11:30 - 11:50	- Description of Program Component I, Environmental Health Risk
	- Discussion of activities and implementation plan
11:50 - 12:10	- Description of Program Component II, Water Quality
	- Discussion of activities and implementation plan
12:10 - 12:20	- Break
12:20 - 12:40	- Description of Program Component III, Agricultural Production
	- Discussion of activities and implementation plan
12:40 - 12:50	- Discussion of integration of program components
12:50 - 13:00	- Next Steps
	- Adjourn

Appendix B

Proposed Criteria for Site Selection Process (Boinchan)

Proposals

on the field-based demonstration sites ~~choice~~ selection for the USA ID EPT Project

Field-based demonstration sites should display and reflect the soil and climatic conditions of Moldova; that is why it is desirable to locate them in three places: in the North, in the Centre and in the South of Moldova. If it is not possible - two sites (one in the North and another in the South) could suffice for the matter

The following organizations and companies could serve as such demonstration sites:

In the North – the Scientific-Research Institute of Field Crops SPA SELECTIA with its experimental field-based production farm.

In the Centre – the Joint-stock company "Moldova" in Orhei District, Sîrota village.

In the South – the field-based farm of the Scientific-Research Institute of Pedology and Soil Chemistry in Cahul District, Lebedeni village.

The experimental field-based farm of the Scientific-Research Institute of Pedology and Soil Chemistry in Tvardita village could also be used, as it is well known for its new technologies programs and sound technical equipment.

The main criterion for the choice of a field polygon is that the farm uses a multilevel system of farming, that includes the antierosion land treatment, a crop rotation system with the attending system of rational and judicious soil cultivation, the use of fertilizers and the application of methods that provide a considerable decrease in number and harmfulness of

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pests, diseases, weeds, etc.

The field-based demonstration sites should serve as a model of efficient farming, oriented on the predominant use of natural resources and a trend to return nutricious substances to the soil as the number of imported costly equipment and the use of ecologically and chemically dangerous substances (including fertilizers and pesticides) were considerably reduced. Taking into consideration this fact the farms should optimize the correlation between livestock and cattle breeding, plant growing and pastures enhancement.

The long-term experimental research carried out on the fields of the Scientific-Research Institute of Field Crops (for more than 30 years) on crop rotation, soil treatment and manure prove that there is a real possibility to decrease the chemical treatment of plough-lands, ~~and~~ which could ensure a decrease of environment pollution and public health risks.

Since fall 1994 the farming systems department of the Scientific-Research Institute of Field Crops has been carrying a comparative assessment of the energy consumption, financial expenditures and environmental risks of the existing improved system of farming in Moldova. The data obtained gives an ample assessment of different crop rotation systems, fertilizing and new soil protection systems.

The American system of soil protection can be tested on a long-term basis in stationary experiments. The field-base experimental farm is situated on a hillside with a 5-7 steepness.

The research carried out on the farm fields is a part of a complex annual investigation program aimed at checking the agrophysical, agrochemical and biological indices B-

of soil richness and fertility in many field and laboratory tests, carried out by specialists of the farming systems department and several other related departments.

The Scientific-Research Institute of Field Crops has a highly-trained tractor and field-crop cultivation team, capable of carrying all the necessary field works both on the farms and during production tests very efficiently within the shortest possible time.

The specialists of the farming systems department have been carrying out scientific and research work, as well as practical work on Moldavian steppe. The Scientific-Research Institute of Field Crops is famous for its works on selection, seed growing and main field crops cultivation technologies that were widely applied on Moldavian fields and in other republics of the former Soviet Union.

Annual demonstrations are carried on the experimental fields of the Institute, at which specialists from all parts of Moldova study the new selection works on different field crops and new technologies. We consider the demonstration of US experience in ecologically and economically sound agricultural production practices highly desirable and important. It can be done on the fields of the Scientific-Research Institute in Balti. Not far from the Scientific-Research Institute of Field Crops in Balti are situated: a) the North-zone agro-chemical laboratory, equipped with all necessary and modern equipment, capable to carry various tests (in addition to those carried by the Chisinau Institute) on soil, crops and water conditions; b) Sanitation and Epidemiological Centre; c) Zonal affiliated office of the Environment Protection Service; d) the biggest Medicine Check-up and Treatment Centre in the North of Moldova. All these organizations can take an active part in the Project.

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VIUVI Scientific - Research Institute of Field Crops has experimental plots of land in addition to the fields of the experimental production farm which can be used for various demonstration needs.

The experimental production farm "Moldova" in Orhei District is located on lands typical for the Central part of Moldova. Chişinău Scientific - Research Institute in cooperation with the Institute of Plant Bioprotection and the Institute of Fruit - Growing have started work on making this farm an exemplary - demonstration site. The Director and the chief - agronomist of the farm do their best to ensure the success of the venture.

The farm in the South of Moldova can serve as a model of antierosion operations, that include all agrotechnical procedures. Taking into consideration the fact that many Departments and Ministeries of Moldova are interested in the Project it seems desirable to charge James Holderbaum to carry a joint general coordination of the Project together with the Oversight Committee.

It is possible to demonstrate on one field the methods for decreasing environment pollution and destruction together with the subsoil waters quality tests or the pesticides contents tests but they will expose some inconsistency in the time of soil cultivation and subsoil waters processing. The US alternative system of farming can help to learn how to lessen or prevent environment and subsoil waters contamination and can also help to prevent possible consequences of human activities for the soil condition. Taking into consideration all mentioned above it seems reasonable to demonstrate these methods not on a single field but at several places, on the fields with a high contamination risk.

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How to Organize Demonstration Sites:

- In order to preserve the equipment in good condition and to ensure a better demonstration of it (regardless of weather conditions), it is necessary to build a module for preserving the equipment. In a separate section of the module video-films could be shown with new ecologically sound technologies. Organizations that take part in the Project will be responsible for the module functioning and building.
- In order to organize seminars and conferences and help in the organization of module building it is necessary to engage temporarily on a contract basis one specialist with good computer skills and good knowledge of the English language.
- In order to ensure a better use of the demonstration sites it seems necessary to locate them in the proximity to the equipment warehouse.

How to Organize Seminars and Conferences:

Chisinau Scientific-Research Institute of Field Crops has good experience in organizing various Republican and zonal seminars and conferences with fields demonstration. It seems reasonable to combine demonstrations of new equipment and environment protection technologies with field works demonstrations for the specialists and farmers during all the vegetation period. Demonstration days are named when the polygone is ready. If demonstration courses last for 2-3 days the Institute will provide the participants with a place for the overnight stay and meals.

If the demonstration sites are equipped with various modern equipment - than primary, secondary and higher education students, teachers from Balti and neighbouring towns and villages can visit them. Responsible for this will be the Young Scientists Council

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The polygon could be visited college and vocational schools students / teachers that are habitual visitors of such demonstration sites. The polygon could also serve as a place where farmers, ecologist, health and agriculture specialists, as well as decision-makers could meet for providing cooperation in production issues, regulatory compliance, environmental monitoring, and public health issues.

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Appendix C

Notes From the Meeting of theAdvisory Group on Developing the Criteria for Site Selection (4/5/95)

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The meeting of Technical Advisory Group

April 25, 1995

Dr. Andriesh proposed the following criteria to be taken into account in the site selection process:
- geomorphological description of different ares (North, Center, South)
- soil conditions;
- weather conditions;
- typical features of agricultural fields and types of agricultural production;
- main sourses of air, water and soil pollution (especially of antropogenic origin)
- the stage of environment degradation.

D.Siretseanu, Sanitary Epidemiology Center, mentioned that the identity and component representativity of subterranean water should be taken into account, when selecting sites. Also the possibilities for investigations are to be indicated.

Dr. Opopol came with the proposal to include the criteria: availability and level of medical services in different areas of Moldova/extent of public health services.

Pr. Duca suggested to include criteria: typical features of agricultural production consumption.

A.Capcelea:- Social and Economic conditions;
- type of farms (state-owned, joint-stock company and sizes).

He proposed to select demonstration sites of different social and economic conditions (with typical and extreme conditions)

Mr. Fandofan attentioned that existence and availability of technical/mechanical capability is extremly important (farm machinery, irrigation equipment, storage, machinery/equipment maintainance).

Appendix D

Memo on Site Selection Process for Moldova Environment Program (4/14/95)

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

EPT/MOLDOVA Field Office
Chisinau, Moldova 277012, str. 31 August, 98 #411

Telephone: 24-87-62 Intl. (373-2) CIS (042-2) Fax:24-84-78

MEMORANDUM

TO: See Distribution

FROM: James Holderbaum, USAID-EPT/Moldova

COPIES:

DATE: April 14, 1995

SUBJECT: Site Selection for the Moldova Environment Program

Distribution:

Margareta Petrushevski	Voinyak
Boinchan	Andreis
Siritsanu	Opopol
Gavralitsa	

The purpose of this memo is to clarify the process that will be used for selecting the locations for the demonstration activities under the USAID Moldova Environment Program. This memo also describes the next steps to be taken in the process.

Criteria for Site Selection

During the meeting held on April 5, 1995, all participants agreed to selection criteria that would be used for final selection of the locations for the demonstration activities. The criteria are:

1. Physical Conditions (representative/typical for Moldova)

   1.a geomorphology of the territory
   1.b soil types
   1.c climatic conditions (temperature, precipitation, growing days, etc.)
   1.d lithological/mechanical soil composition
   1.e main sources of pollution (point and non-point)
   1.f extent and severity of environmental degradation (of soil and water)
   1.g ground water resources and suitability for investigation

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2. Social and Economic Conditions

   2.a Type of farm (state-owned, private, joint-stock company, institution-owned) and size
   2.b Type of agricultural production (vineyards, orchards, grain crops, livestock, etc.)
   2.c Proximity to schools, colleges, other research institutions
   2.d Extent of public health services

3. Administration/Management and Logistical Capacity

   3.a Existing technical/mechanical capability (farm machinery, irrigation equipment, storage, machinery/equipment maintenance,)
   3.b Accessability (conditions of roads, available public transportation, etc.)
   3.c. Day and over-night accommodations (availability, capacity, and proximity to location)
   3.d Office space, meeting/conference rooms

In addition to these criteria, we need to obtain information on:

4. Who will benefit from demonstrations at this location and who are we demonstrating for?

5. How the host of each location will arrange for academic and research institutions to participate in, and have access to, demonstration activities at the location?

Preliminary List of Proposed Sites

During the meeting on April 5th, five sites were proposed as possible locations for the demonstration program. These were:

1. Lebedenko, Region Cahul, (Join-Stock company "Prietenia")
2. Karagasan, Region Stefan-Voda, (Institute of Water Problems)
3. Cetrosy, Region Anenii Noi, (Agrarian University)
4. Region Orhei, (Joint-Stock company "Moldova")
5. Beltsy, Experimental Farm of Institute of Field Crops "Selectia"

Site Selection Process

It was agreed that each site would be visited by a delegation representing

the agriculture, Department of Environmental Protection, health, and water quality/monitoring cooperators in the project. The sites would be evaluated based on the criteria outlined above. A written report is to be prepared for each site. When all sites are visited and all reports prepared, the group will meet again to make final selection.

Five people visited Lebedenko on April 7th. A report is being prepared on this site visit and I would like comments from each person who visited the site regarding the criteria agreed upon.

The remaining site visits are being planned as follows:

Caragasan	A visit to Caragasan on Tuesday, April 18th, leaving Chisinau at 13:00 and returning to Chisinau by 18:00.
Beltsy/Orhei	A visit to Beltsy and Orhei on Wednesday, April 19th (we will leave Chisinau for Beltsy at 7:00 and leave Beltsy at 12:00 for Orhei and plan on returning to Chisinau by 18:00.
Cetrosy	A visit to Cetrosy on Thursday April 20th in the early afternoon.

We will also schedule a site visit to Chadur-Lunga for the early part of the week of April 24th.

Please let me know by Tuesday morning, April 18, if you will be participating in these site visits.

Final Site Selection

When site reports have been prepared for each location, we will meet and review the reports and make a final determination on locations. We would like to make final selection by April 28.

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

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Internaţională

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
EPT/Moldova Field Office

PROIECTUL POLITICII ŞI TECHNOLOGIEI PROTECŢIEI MEDIULUI AMBIANT
EPT/Oficiul Regional Din Moldova

MEMORANDUM

CATRE: Vezi Distributia

DE LA: James Holderbaum, Directorul Programului USAID-EPT/Moldova

DATA: Aprilie 13, 1995

SUBIECTUL: Selectarea localitatii pentru Programul Protectiei Mediului Ambiant in Moldova

Distributia:

Margareta Petrusevschi
Boris Boincean
Dumitu Sireteanu
Andrei Gavrilita
Vasile Voineac
Serafim Andries
Nicolae Opopol

Scopul acestui memorandum este de a clarifica procesul care va fi folosit la selectarea localitatilor pentru dezvaluirea activitatilor de demonstrare in cadrul Programului protectiei Mediului Ambiant in Moldova. Acest memorandum de asemenea descrie etapele procesului de selectare.

Criteriile de selectare a localitatilor

La adunarea din 5 aprilie, 1995 toti particpantii au convenit sa urmeze anumite criterii in procesul selectarii localitatilor pentru desfasurare a activitatilor de demonstrare.Aceste criterii sint:

1. Conditiile fizice (reprezentative / tipice pentru Moldova)

   1.a. geomorfologia teritoriului
   1.b. tipurile de soluri
   1.c. conditiile climaterice (temperatura, precipitatiile, zilele de crestere etc.)
   1.d. compozitia litologica/mecanica a solului
   1.e. sursele principale de poluare (un punct anumit: intreprindere etc. / diverse puncte)
   1.f. extinderea si severitatea degradarii mediului ambiant (a solului si apei)
   1.g. resursele de apa terestra si favorabilitatea pentru investigare

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2. Conditiile sociale si economice

   2.a. Tipul gospodariei (proprietete de stat, companie pe actiuni, proprietate a institutiei) si marimea
   2.b. Tipul productiei de agricultura (vii, livezi, culturi cerealiere, cresterea animalelor,etc)
   2.c. Apropierea fata de scoli, colegii, alte institutii de invatamint si cercetari
   2.e. Existenta serviciilor publice de ocrotire a sanatatii

3. Capacitatea de administrare /coordonare si organizare materiala

   3.a. Existenta capabilitatii tehnice/mecanice (masini pentru gospodarie, echipament pentru irigare (depozitare) ,mentinerea masinilor / echipamentului in buna conditie)
   3.b. Accesibilitatea (drumuri bune, transport public disponibil /accesibil, etc.)
   3.c. Conditiile de cazare de zi si de noapte disponibile (disponibilitatea, capacitatea si apropierea fata de localitate)
   3.d. Spatiu pentru oficiu, odai pentru adunari/conferinte.

Plus la informatia care oglindeste aceste criterii mai urmeaza sa obtinem informatie despre:

4 Cine va beneficia in rezultatul acestor demonstrari in localitati si pentru cine noi demonstram?

5. In ce mod fiecare localitate-gazda va organiza participarea si accesul institutiilor de cercetari si institutiilor academice la activitatile de demonstrare, care vor avea loc in localitate?

Lista preliminara a localitatilor propuse

La adunarea din 5 aprilie, 1995 au fost propuse 5 localitati posibile pentru desfasurarea activitatilor de demonstrare. Aceste localitati sint:

1. c. Lebedenco, r. Cahul, (compania pe actiuni "Prietenia)
2. Caragasan, r. Stefan-Voda.(Institutul Problemelor Apei si Ameliorarii)
3. Chetros, Anenii-Noi (Universitatea Agrara)
4. Raionul Orhei (Compania pe actiuni "Moldova")
5. Balti, gospodaria experimentala a Institutului Culturilor de cimp "Selectia").

Procesul de selectare a localitatii

S-a convenit ca fiecare localitate va fi vizitata de catre o delegatie formata din membrii grupului de

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agricultura, Departamentul pentru Protectia Mediului Ambiant, grupului de ocrotire a sanatatii si grupului de monitoring al calitatii apei, grupuri care conlucreaza in cadrul proiectului. Localitatile trebuie sa fie evaluate in baza criteriilor trasate mai sus. Pentru fiecare localitate urmeaza a fi pragatit cite un raport (in scris). Cind toate localitatile vor fi vizitate si toate rapoartele pregatite, grupul de lucru se va intruni iarasi, pentru a lua decizia finala.

Cinci persoane au vizitat comuna Lebedenco la 7 aprilie. Un raport, vizind aceasta vizita se pregateste acum si eu as dori sa primesc de la fiecare persoana comentariile respective, urmind criteriile indicate mai sus.

Pentru celelalte localitati se planifica vizite dupa cum urmeaza:

Balti/Orhei	O vizita la Balti si la Orhei miercuri, 19 aprilie (plecarea din Chisinau spre Balti la ora 7:00 si plecarea din Balti spre Orhei la ora 12:00, planuim sa ne intoarcem la Chisinau catre ora 18:00) .
Chetros	O vizita la Chetros joi, 20 aprilie, dupa orele 12:00.
Caragasan	O vizita la Caragasan vineri, 21 aprlie, plecarea din Chisinau la ora 13:00, intoarcerea catre ora 18:00.

De asemenea vom planifica o vizita la Ciadir-Lunga pentru prima jumatate a saptaminii sau pentru 24 aprilie.

Va rog sa-mi comunicati catre dimineata zilei de marti, 18 aprilie, daca veti participa la aceste vizite.

Selectarea finala a localitatilor

Cind vor fi pregatite toate rapoartele despre fiecare dintre localitati, noi ne vom intruni, pentru a le studia si a lua decizia finala. Am dori sa efectuam selectarea finala catre 28 aprilie.

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Appendix E

Action Memorandum (4/21/95)

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Appendix F

Criteria for Site Selection - CCN Input

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ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

EPT/MOLDOVA Field Office
Chisinau, Moldova 277012, str. 31 August, 98 #411

Telephone: 24-87-62 Intl. (373-2) CIS (042-2) Fax:24-84-78

Criteria for Site Selection

Site name

1. Physical Conditions (representative/typical for Moldova)

   1.a. geomorphology of the territory

   1.b. soil types

   1.c. climatic conditions (temperature, precipitation, growing days, etc.)

   1.d lithological/mechanical soil composition

   1.e main sources of pollution (point and non-point)

   1.f extent and severity of environmental degradation (of soil and water)

   1.g ground water resources and suitability for investigation

   2. Social and Economic Conditions

2.a. Type of farm (state-owned, private, joint-stock company, institution-owned) and size

2.b Type of agricultural production (vineyards, orchards, grain crops, livestock, etc.)

2.c Proximity to schools, colleges, other research institutions

2.d Extent of public health services

3. Administration/Management and Logistical Capacity

3.a. Existing technical/mechanical capability (farm machinery, irrigation equipment, storage, machinery/equipment maintenance,)

3.b. Accessability (conditions of roads, available public transportation, etc.)

3.c. Day and over-night accommodations (availability, capacity, and proximity to location)

3.d Office space, meeting/conference rooms

4. who will benefit from demonstrations at this location and who are we demonstrating for?

5. how the host of each location will arrange for academic and research institutions to participate in, and have access to, demonstration activities at the location?

PROIECTUL POLITICII SI TEHNOLOGIEI PROTECTIEI MEDIULUI AMBIANT

Oficiul Regional EPT/MOLDOVA
Chisinau, Moldova 277012, str. 31 August, 98 #411

Telepon: 24-87-62 Intl. (373-2) CIS (042-2) Fax:24-84-78

Criterile de selectare a localitatilor

Denumirea Gospodariei

1. Conditiile fizice (reprezentative/tipice pentru Moldova)

   1.a. geomorfologia teritoriului

   1.b. tipurile de soluri

   1.c. conditiile climaterice (temperatura, precipitatiile, perioada de vegetatie etc)

   1.d componenta litologica/mecanica a solului

   1.e sursele principale de poluare (un punct anumid: intreprindere, etc./diverse puncte)

   1.f extinderea si severitatea degradarii mediului ambiant (a solului si apei)

   1.g resursele de apa terestra si favorabilitatea pentru investigare

   2. Conditiile sociale si economice

2.a. Tipul gospodariei (proprietate de stat, societate pe actiuni, proprietate a institutiei) si marimea

2.b Tipul productiei agricole (vii, livezi, culturi cerealiere, cresterea animalelor, etc.)

2.c Apropierea fata de scoli, colegii, alte institutii de invatamint si cercetari.

2.d Extistenta serviciilor publice de ocrotire a sanatatii.

3. Capacitatea de administrare/coordonare si organizare materiala

3.a. Existenta capabilitatii tehnice/mecanice (masini pentru gospodarie, echipament pentru irigare (depozitare), mentinerea masinilor /echipamentului in buna conditie)

3.b. Accesibilitatea (drumuri bune, transport public disponibil.accesibil, etc)

3.c. Conditiile de cazare de zi si de noapte disponibile (disponibilitatea, capacitatea si apropierea fata de localitate)

3.d Spatiu pentru oficiu, odai pentru adunari/conferinte.

4. Cine va beneficia in rezultatul acestor demonstrari si pentru cine noi demonstram?

5. In ce mod fiecare localitate-gazda va organiza participarea si accsesul institutiilor de cercetari si institutiilor academice la activitatile de demonstrare care vor avea oc in localitate?

CRITERIA FOR SITE SELECTION

A COMPILATION OF CCN INPUT

BELTSY

Site name: The Research Institute for Field Crops "Selectia"

1. Physical Conditions (representative/typical for Moldova)

1 a. Geomorphology of the territory
The conditions of the relief do not present an erosive danger, because all the requirements of respective scientific works are followed (Andriesh)
Representative for the Beltsy zone (Opopol)

1 b. Soil types
Typical and simple chernozem, Modal (typical) and levigated chernozems, representative for the northern zone of the Republic and sufficiently resistant to the erosion (Andriesh)
Typical and simple chernozem (Boinchan)

1 c. Climatic conditions (temperature, precipitation, growing days, etc.)
The average multi annual temperature - 8,7'C
The average amount of multi annual precipitation - 445 mm
Vegetation period - 230-250 days (Boinchan)
Torrential rains, periodically having a intensity, which can cause soil erosion of great dimensions (Andriesh)

1 d. Lithological/mechanical soil composition
Clay, loamy soils (Andriesh)

1 e. Main sources of pollution (point and non-point)
Fertilizers, pesticides application (Boinchan)
Chemical means of crops protection, amendments (Andriesh)
Slightly manifested diffuse pollution with agrochemicals, the influence of Beltsy city industrial zone (Opopol)

1 f. Extent and severity of environmental degradation (of soil and water)
A high level of well pollution with nitrates (Boinchan)
The soils suffered because of their intensive utilizing (mineralization of the humus, etc.) (Andriesh)
Data, regarding subterranean and surface water quality is not available (Opopol)

1 g. **Ground water resources and suitability for investigation**
On some areas the freatic waters are close to the surface, this facilitates determining of their quality (Boinchan)
There exists favorable conditions for investigations (Opopol)

2. **Social and Economic Conditions**

2 a. **Type of farm (state-owned, private, joint-stock company, institution-owned) and size**
State-owned

2 b. **Type of agricultural production (vineyards, orchards, grain crops, livestock, etc.)**
Field crops (Boinchan)

2 c. **Proximity to schools, colleges, other research institutions**
The experimental fields are situated close to the city, but the students of neighboring Marculeshti, Tsaul agricultural colleges, Moldova State Agrarian University as well as specialists of different agricultural farms have practices in this area (Boinchan)

2 d. **Extent of public health services**
The sanitary-epidemiological station and some clinical hospitals are situated in Beltsy (Boinchan)
There exists a specialized medical service, but there is no population in the zone, which could be eventually influenced/affected (Opopol)

3. **Administration/Management and Logistical Capacity**

3 a. **Existing technical/mechanical capability (farm machinery, irrigation equipment, storage, machinery/equipment maintenance)**

The Institute has a specialized technical team for work on experimental areas (Boinchan)

3 b. **Accessibility (conditions of roads, available public transportation, etc.)**
The roads to the fields are good (Boinchan)

3.c. **Day and over-night accommodations (availability, capacity, and proximity to location)**
Available (Boinchan)

3.d **Office space, meeting/conference rooms**
Available (Boinchan)

4. **Who will benefit from demonstrations at this location and who are we demonstrating for?**

The students of colleges and other educational institutions as well as students of city and close to the city schools will benefit from this demo. The agricultural equipment will be used for scientific research activities (Boinchan)

5. **How will the host of each location arrange for academic and research institutions to participate in, and have access to, demonstration activities at the location?**

The activities will be performed in cooperation with other interested institutions an organizations, either from Beltsy and from other moldova cities, and from out of Moldova places (Boinchan)

From the ecohygienical point of view the site can not serve as an area for investigation, because of population absence, which could be eventually affected, as well as because of city industrial zone impact on agricultural fields

ORHEI

Site name: Joint-Stock company "Moldova", located in the village of Sirota

1. Physical Conditions (representative/typical for Moldova)

1 a. Geomorphology of the territory
The relief is erosive: long inclined slopes (Andriesh)
Represents the central zone of Moldova (Codru zone) (Opopol)

1 b. Soil types
Levigated chernozems and podzolic forest soils with a media (Andriesh)
Simple chernozem (Boinchan)

1 c. Climatic conditions (temperature, precipitation, growing days)
Abundant rains, periodically causing erosion (Andriesh)
The average multi annual temperature -9,0 - 9,5 'C, the average amount of multi annual precipitation - 420-430 mm (Boinchan)

1 d. Lithological/mechanical soil composition
Clay and loamy soils (Andriesh)

1 e. Main sources of pollution (point and non-point)
Pesticides and amendments (Andriesh)
Diffused pollution with agrochemicals and organic materials from zootechnical complexes (Opopol)
Fertilizers, pesticides application (Boinchan)

1 f. Extent and severity of environmental degradation (of soil and water)
The degradation of fertility is caused by soils erosion, which appears, because the agricultural areas are not equipped/arranged (Andriesh)
A high level of soil erosion (Boinchan)
General mineralization (up to 4650 mg/l), high content of NO3 (up to 238 mg/l), chloride (up to 850 mg/l), sulfates (up to 2140 mg/l), fluoride (up to 2 mg/l) (Opopol)

1 g. Ground water resources and suitability for investigation
Can serve as a model for investigations (Opopol)

2. Social and Economic Conditions

2 a. Type of farm (state-owned, private, joint-stock company, institution-owned) and size
Joint-stock company

2 b. Type of agricultural production (vineyards, orchards, grain crops, livestock, etc.)
Complex farm with different agricultural branches developed:field

crops, orchards,vineyards, vegetable crops, livestock (Boinchan)

2.c Proximity to schools, colleges, other research institutions
The farm is situated on the territory of former agricultural college, which exists now as an independent unit, closely neighboring with the site (Boinchan).
Secondary school and Agricultural college

2.d Extent of public health services
There is a regional hospital (in Orhei) that can serve as a base for the medical checks performing (Opopol)
There are a veterinarian dispensary and a medical (first-aid) station in the village (Boinchan)

3. Administration/Management and Logistical Capacity

3.a. Existing technical/mechanical capability (farm machinery, irrigation equipment, storage, machinery/equipment maintenance)
The farm has all the necessary technical equipment. There are specialists interested in testing new, modern machines (equipment). The farm collaborates with 3 specialized moldovan research institutes (Boinchan)

3.b. Accessibility (conditions of roads, available public transportation)
The roads are good. Available daily transportation to Orhei.

3.c. Day and over-night accommodations (availability, capacity, and proximity to location)
Acceptable: Agricultural college, which is situated on the distance of 7 km from the village Sirota (Boinchan)

3.d Office space, meeting/conference rooms
Available

4. Who will benefit from demonstrations at this location and who are we demonstrating for?

The Demonstration Center will serve as a center for propaganda and training of specialists, farmers, agricultural college students (Boinchan)

5. How will the host of each location arrange for academic and research institutions to participate in, and have access to, demonstration activities at the location?

The farm already collaborates with scientific institutions (Beltsy "Selectia" Institute, Chisinau Institute for Plant Bioprotection, "Codru" Institute) (Boinchan)

CAHUL

Site name: Joint-Stock Company "Prietenia", villages Crihana-Noua, Lebedenco, Gutuly

1. Physical Conditions (representative/typical for Moldova)

1 a. Geomorphology of the territory
The relief is erosive (Andriesh)
Represents the southern zone of the Republic (Opopol)

1 b. Soil types
Common and carbonated chernozem with a minor antierosive resistance (Andriesh)

1 c. Climatic conditions (temperature, precipitation, growing days)
Abundant rains, periodically with high erosive indexes (Andriesh)

1 d. Lithological/mechanical soil composition
Granulometric clay-sandy composition with a low antierosive resistance (Andriesh)

1 e. Main sources of pollution (point and non-point)
Chemical means (substances), used for crops protection and intensification of their production (Andriesh)
Diffuse pollution with agrochemicals and organic materials (Opopol)

1 f. Extent and severity of environmental degradation (of soil and water)
The soils are mostly eroded from the low up to the high level, having a low humus content (Andriesh)
High grade of soil erosion. Freatic waters general mineralization (up to 1665 mg/l and high content of NO3 (up to 729 mg/l), Cl (up to 370 mg/l), rarely F (up to 2 mg/l) (Opopol)

1 g. Ground water resources and suitability for investigation
Can serve as appropriate model for investigation, having all the elements (features) of the environment degrading process (Opopol)

2. Social and Economic Conditions

2 a. Type of farm (state-owned, private, joint-stock company, institution-owned) and size
Joint-stock company
Total farm area - 3,536 ha, of which: 30% is plowed land, 30% - grain crops (including 205 ha of irrigated land)

2 b. Type of agricultural production (vineyards, orchards, grain crops, livestock, etc.)

10% - peas, 15% - alfalfa, 30% - corn, 30% - cereals
Vineyards - 616 ha (100 ha - apples, 30ha - plums, 60 ha - peaches, 5 ha - sweet cherries)
Pasture land - 561 ha
Winter wheat - 993 ha
Barley - 271 ha
Winter green forage plants - 50 ha
Peas - 301 ha
Spring barley - 20 ha
Oats - 35 ha
Grain corn- 630 ha
Buckwheat - 20 ha
Kidney beans - 10 ha
Sunflower - 267 ha
Vegetables - 53 ha
Melon field - 15 ha
Forage root plants - 40 ha
Corn for silage - 238 ha
Annual grasses - 80 ha
Perennial grasses - 465 ha
Livestock:
Dairy cattle (cows) - 380 (annual yield is 2,500 liters, milk is transported 16 km to Cahul to be processed for cheese and butter)
Pigs - 400
Sheep - 10,000 (for wool and cheese)
Geese - 3,000 (for egg breeding)

2 c. Proximity to schools, colleges, other research institutions
Agricultural college and secondary school

2 d. Extent of public health services
There exists a district hospital, which could be accepted as the place for performing medical tests (Opopol)

3. Administration/Management and Logistical Capacity

3 a. Existing technical/mechanical capability (farm machinery, irrigation equipment, storage, machinery/equipment maintenance)

3 b. Accessibility (conditions of roads, available public transportation, etc.)
Acceptable

3 c. Day and over-night accommodations (availability, capacity, and proximity to location)
Acceptable

3 d. Office space, meeting/conference rooms
Acceptable

4. Who will benefit from demonstrations at this location and who are we demonstrating for?

5. How will the host of each location arrange for academic and research institutions to participate in, and have access to, demonstration activities at the location?

From the ecohygienical point of view the site can serve as an representative for the southern zone area of investigation. (Opopol)

Appendix G

Memo to the Members of the Advisory Group (4/26/95)

MEMORANDUM

TO: V.Voineac B.Boinchan
S.Andriesh D. Siretsenu
N.Opopol A.Gavrilitsa
I.Bucinschi.

FROM: James Holderbaum, EPT/Moldova Program Manager

DATE: April 26, 1995

You are invited to attend the meeting of the Thechnical Advisory Committee on Final Site Selection, tomorrow, April 27, at 1:00 p.m., in the EPT Office.

We would like to have all your comments on sites visited before the meeting (site selection criteria), plese, present them to the EPT Office during this day or tomorrow in the morning.

J.Holderbaum

EPT/Moldova Program Manager

G-96

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
EPT/Moldova Field Office

PROIECTUL POLITICII ŞI TECHNOLOGIEI PROTECŢIEI MEDIULUI AMBIANT
EPT/Oficiul Regional Din Moldova

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

A USAID Project
Consortium
Led by
CH2M Hill

Consorţiumul Firmelor
Dirijate de
<<CH2M HILL>>
Proiectul Agenţiei S.U.A.
Pentru Dezvoltare
Internaţională

КОМУ: Войняк В., Андриеш С., Опополь Н., Бучински И., Боинчан Б., Сирецану Д., Гаврилица А.

ОТ: Д. Холдербаума, ЕРТ/Молдова

ДАТА: 26 Апреля 1995

Сообщаем Вам, что завтра, 27 апреля в офисе ЕРТ/Молдова в 13 часов состоится встреча всех членов рабочей группы для принятия окончательного решения по выбору демонстрационных площадок.

Со всеми письменными материалами (критерии по выбору площадок) нам хотелось бы ознакомиться до начала встречи. Вы можете передать их сегодня в течение дня, либо завтра утром.

С уважением,

Джеймс Холдербаум

USAID

Chişinău, Moldova 277012, Str. 31 August, 98 #411
Tel: 248-762/Int: (373-2) Fax: 248-478/CIS: (042-2)
e-mail: root@ept.moldova.su

G-31

Appendix H

Maps of Moldova

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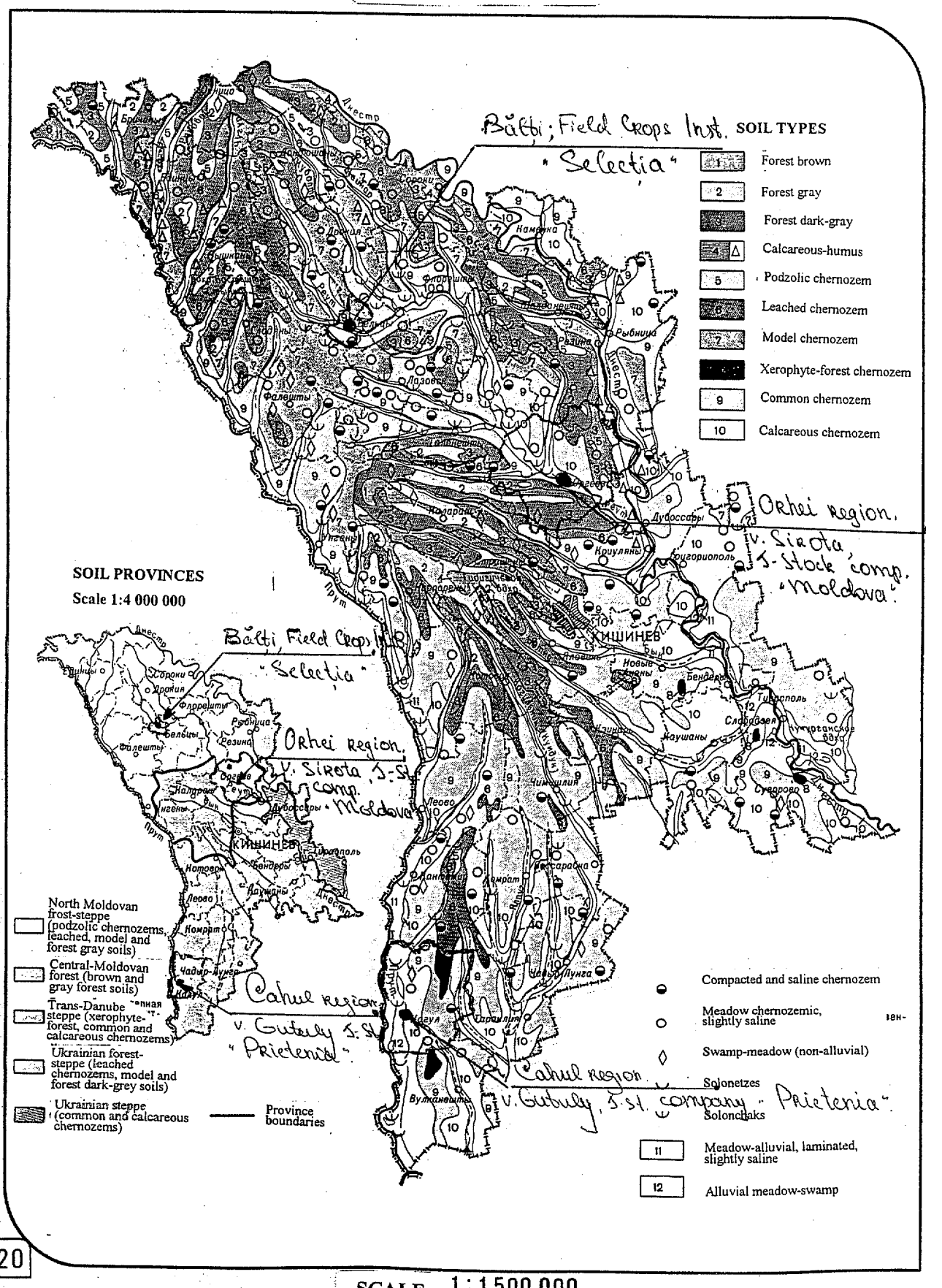
SOIL MAP



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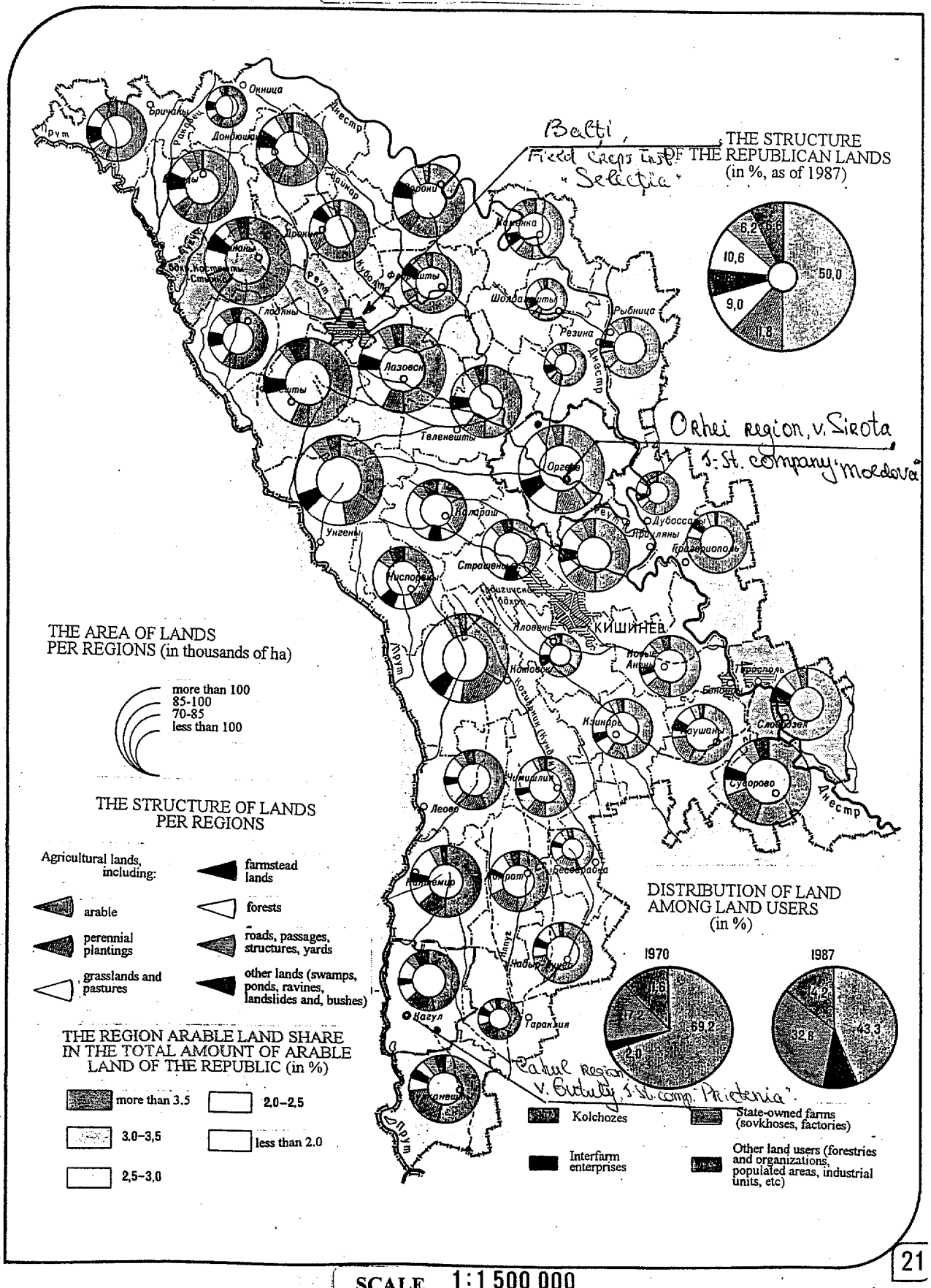
H-2

LANDS



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H-3

LANDSCAPE MAP

STEPPE ZONE

The landscapes of island forest-steppe

Flat and rolling heights (plateaus), composed of alluvial sediments with leached and podzolic chernozems and dark-gray forest soils covered by sumac-durmast oak, hornbeam, ash and lime trees.

Bălți Field Crops Inst. "Selectia"

Steppe landscapes

Rolling valleys and plateaus, composed of sand and clay with common, leached and xerophyte forest chernozems, covered with downy oak forests.

Terrace valleys, divided of common calcareous sometimes xerophyte forest chernozems, covered with downy oak forests.

Steppe (budzhak) landscapes

Flat and slightly rolling valleys of calcareous and common chernozems, covered with thin steppe-type grass varieties.

Orhei region, v. Sirota S.-St. comp. "Moldova"

Terrace valleys of common and calcareous chernozem

FOREST-STEPPE ZONE

Forest (codru) landscapes

1 Hilly ridged heights, composed of sand and clay layers, with brown and gray forest soils, covered by beech, and durmast oak, and hornbeam oak forests.

2 Hilly raged heights, composed of sand and clay, with gray and dark gray forest soils, covered with oak forests (rocky oak forests, with spots of hornbeam, ash and sumacs)

Forest and steppe landscapes

3 Hilly ridged height, composed of clay and sand with leached chernozem, covered with hornbeam and oak, sumac-oak forests.

4 Ridged wavy heights, composed of sand and clay, gray and dark-gray forest soils with podzolic and leached chernozems, covered with hornbeam and oak forests.

5 Plateau and hilly heights, composed of clay with sand layers, gray and dark-gray forest soils, leached and podzolic chernozems covered with seet-cherry orchards.

Остепненные ландшафты речных долин

Stepped landscapes of river valleys.

6 Terraced valleys with typical calcareous and leached chernozems, with occasional oak forests.

7 Divided valleys with various chernozems covered with hornbeam and oak forests.

8 Rocky slopes of canyon- type valleys and reefy hills (composed of limestone) with thin humus carbonate soils covered with dry grassy vegetation and undergrowth of xerophyte shrubs and spout forests.

Meadow-steppe landscapes

9 Gently sloping and rolling plains, composed of clay with with typically common or leached chernozem.

10 Hilly heights, composed of clay with sand layers with typically common and leached chernozem withspots of various typesof sheep's fescue and steppe feather grasses.

11 Hilly heights, composed of clay with common, typical and alkaline chernozems covered with various types of sheep's fescue and motly grasses and spurge-bread grasses(on slipping places).

Alluvial landscapes.

17 Wide river flood plains with alluvial meadow solonchak-like, alluvial meado stratified and silty-meadow-marsh soils, covered with grain and sedge meadows, shrubs of willow and poplar-oak forests.

18 во-злаковыми и злаково-осоковыми лугами Dry river flood plains and gully bottoms with flood plain meadowy stratified soils with legume-grass and grass-sedge meadows. ...ности и плато

ЛЕСОСТЕПНАЯ

Северо-Молдавск

Ia Подобласть лесосте

Ib Подобласть лугово-степных равнин и возвышенностей

II Центральномолдавская (Кодринская) лесная область

СТЕПНАЯ ЗОНА

Южно-Молдавская степная область

IIIa Подобласть гырнецово-степных равнин и лесостепных возвышенностей

IIIb Подобласть степных равнин

ГРАНИЦЫ

зон — области — подобластей

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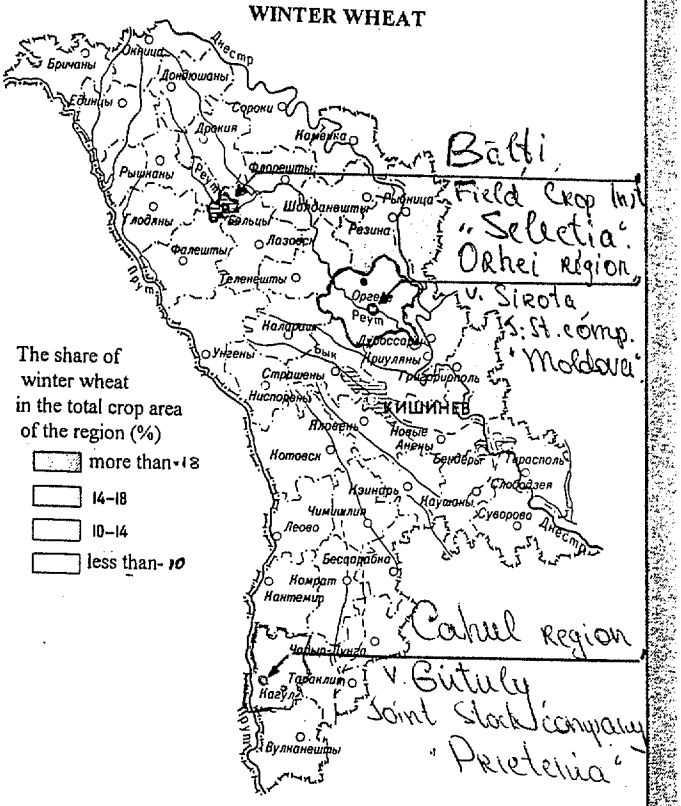
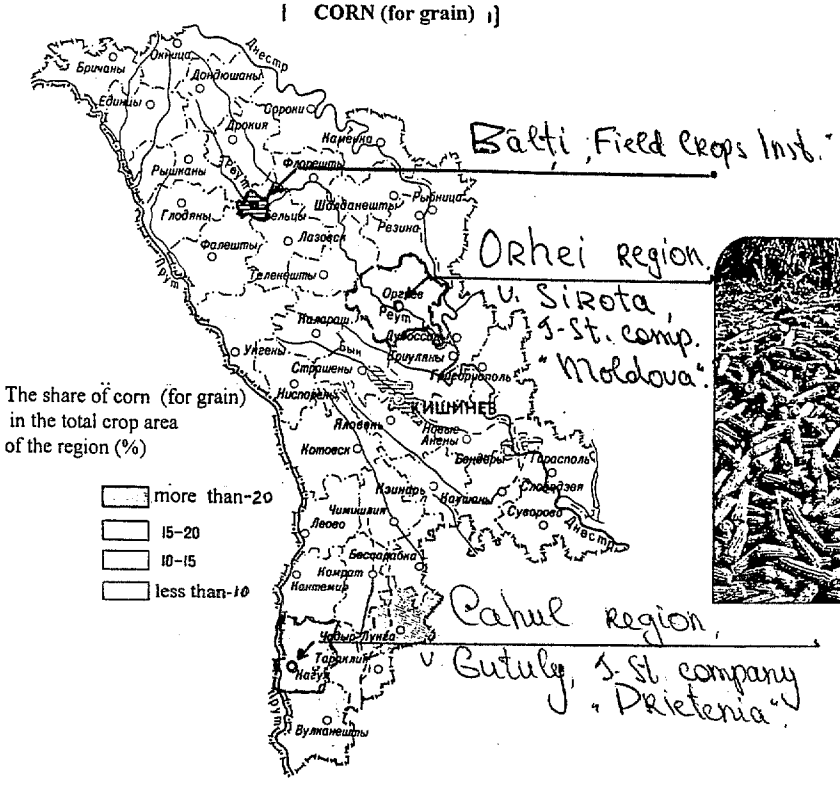
H-4

Уборка пшеницы (колхоз „Заря" Криулянского района)

WINTER WHEAT



CORN (for grain)



Урожай кукурузы

Масштаб 1 : 3 000 000

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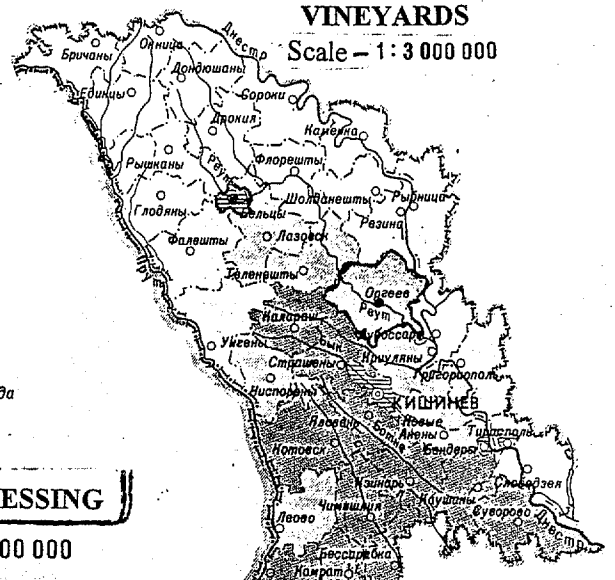
Уборка винограда

VINEYARDS

Scale – 1 : 3 000 000



GRAPES PROCESSING

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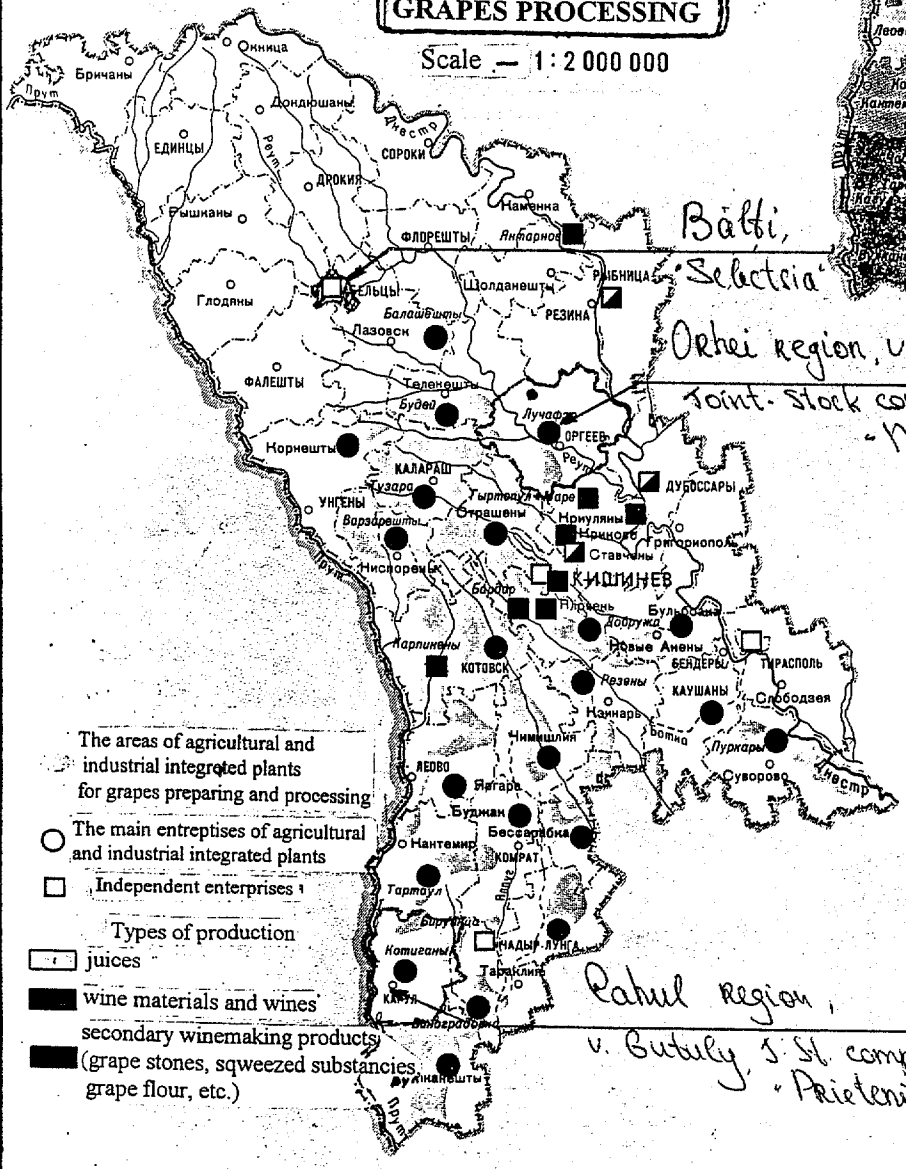


Bălți, "Selectia"

Orhei region, v. Sirota Joint-stock company "Moldova".

Cahul region, v. Butuly, J. St. comp. "Prietenia"

The share of vineyards in the total perrenial crops area of the region (in %)

- more than-30
- 60–80
- 40–60
- 10–40
- 1–10
- less than-1

The areas of agricultural and industrial integrated plants for grapes preparing and processing

The main entreptises of agricultural and industrial integrated plants

Independent enterprises

Types of production

- juices
- wine materials and wines
- secondary winemaking products (grape stones, sqweezed substancies, grape flour, etc.)

14-13

ORCHARDS
Scale 1 : 3 000 000

The share of orchards in the total perrenial crops area (%)
- more than 90
- 80–90
- 50–80
- 20–50
- less than 20

HORTICULTURAL CANNING INDUSTRY
Scale 1 : 2 000 000

Plant capacity, in production output (in mlns of conventional cans a year)
- more than 400
- 100–190
- 50–100
- less than 50

Types of produced canning food
- vegetable
- tomato
- fruit
- food for children

△ Refrigerators for horticultural materials storing and freezing

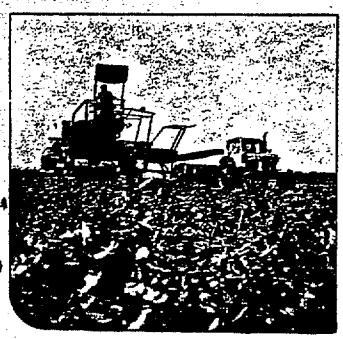
Bălți selectia
Orhei v. Sirota
Joint stock company Moldova
Cahul region
v. Gutuly
J. st. company "Prietenia"

VEGETABLES
Scale — 1 : 3 000 000

The share of vegetables in the total crop area of the region (in %)
- more than 10,0
- 5,0–10,0
- 2,5–5,0
- 1,5–2,5
- less than 1,5

Bălți, Inst. of Field Crops "Selectsia"
ORHEI region.
v. SIROTA
J-st. company "Moldova"
Cahul region
v. Gutuly
J st. comp. "Prietenia"

Экспериментальная продукция молдавского научно-исследовательского института пищевой промышленности



Механизированная уборка томатов (Григориопольский район)

SUGAR- BEET
Scale 1 : 3 000 000

The share of sugar- beet in the total crop area of the region (in%)

- more than 16
- 13–16
- 10–13
- 7–10
- less than 7
- no sugar- beet plantings

SUNFLOWER
Scale – 1 : 3 000 000

The share of sunflower in the total crop area of the region (%)

- 10,0–12,0
- 7,5–10,0
- 5,0–7,5
- less than 5,0

PROCESSING OF MAIN TECHNICAL CROPS

SCALE 1 : 2 000 000

Bălți Field Crops Institute "Selecția"

v. Sirota, I. Sf. comp. "Moldova"

Orhei

SUGAR- BEET PROCESSING

- sugar factories
- sugar alcohol integrated factories
- sugar integrated factories

The capacity of plants for sugar- beet processing (ton per 24 hours)

- более 4 000
- 2 500–4 000
- 1 000–2 500
- менее 1 000

At sugar factories of the Republic the sugar is made not only from sugar-beet, but also from raw reed sugar. Besides sugar the factories produce carbonic acid, citric acid, canned horticultural food, feeding yeast, potable water, alcohol-free beverages, etc.

PROCESSING OF EATHER-OIL RAW MATERIAL

The capacity of ether-oil raw material processing factories (in tones per season)

- более 23 000
- 12 000–15 000
- 10 000–12 000
- менее 10 000

Types of processed raw material

- roses
- mint
- lavender
- sage

Perfume and cosmetic factories

SUN-FLOWER PROCESSING

- oil and fat integrated plant
- oil extracting plants

Chișinău I. Sf. Comp. "Prietenia"

The capacity of sun-flower processing plants (ton per 24 hours) v. Cuhul

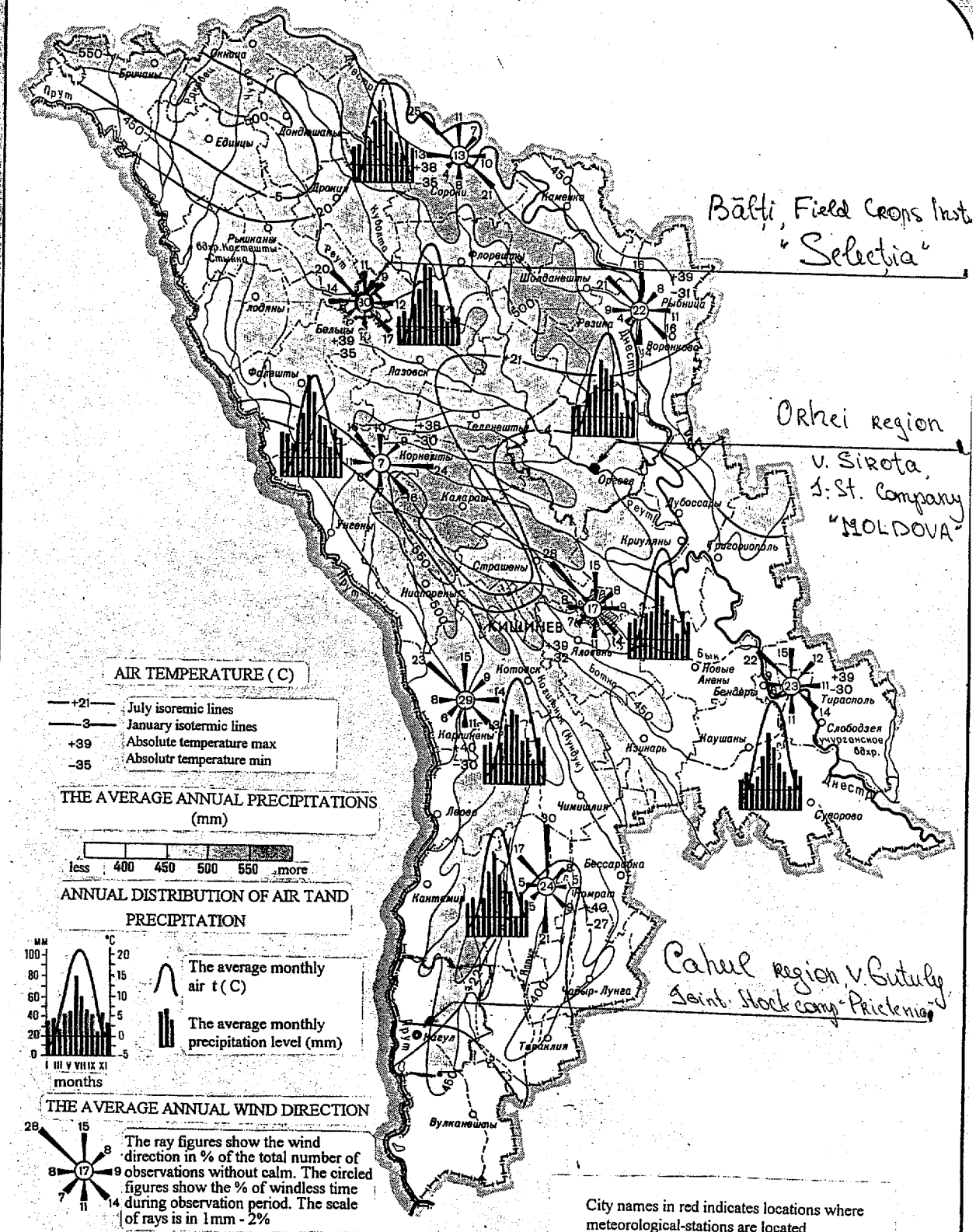
- 840
- 420
- 250

The places, where the processing plants are situated, are marked in red.

Цветет подсолнечник

Уборка лаванды (совхоз „Патрия" Кантемирского района)

CLIMATIC MAP



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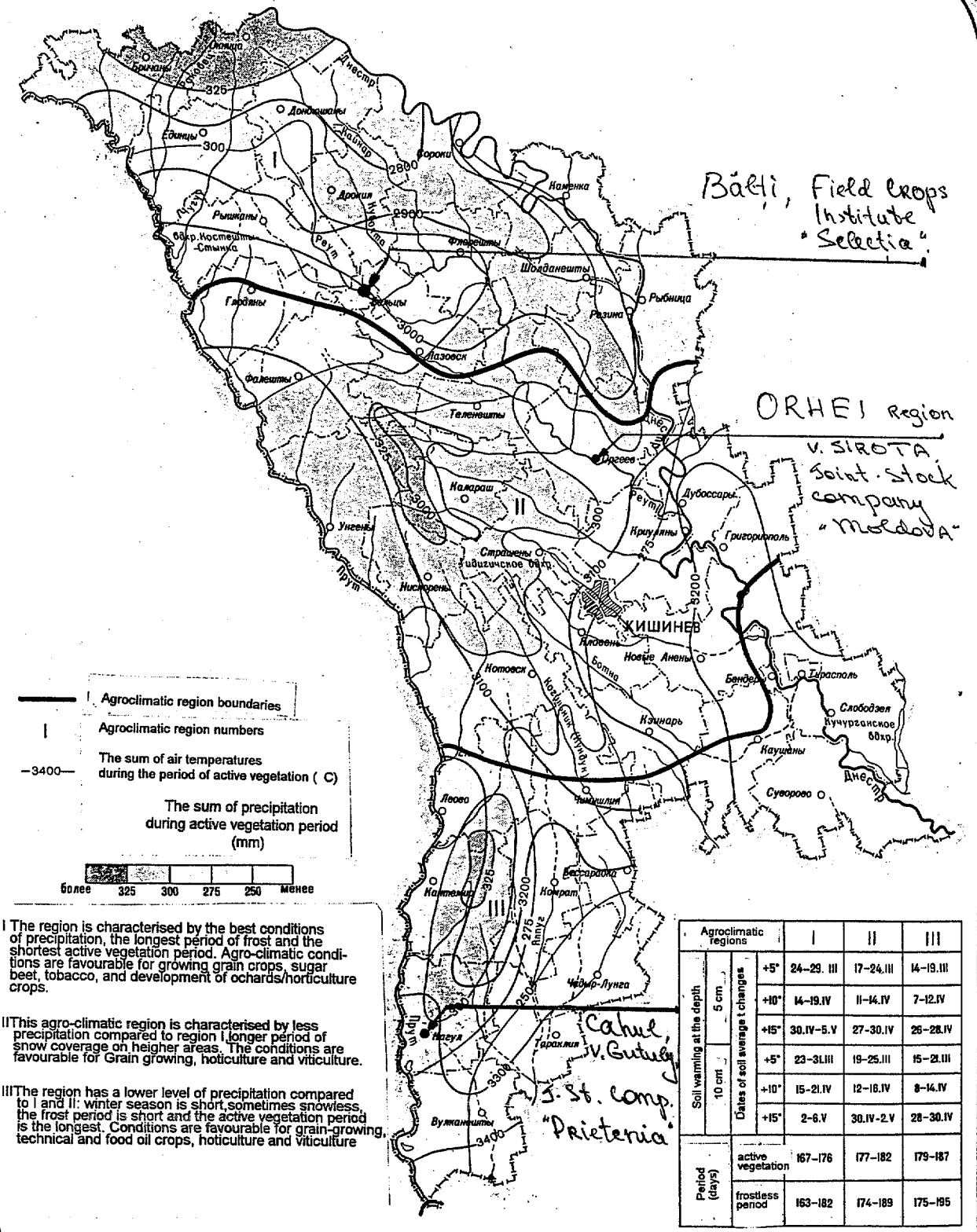
4/16

AGRO-CLIMATIC REGIONING



I The region is characterised by the best conditions of precipitation, the longest period of frost and the shortest active vegetation period. Agro-climatic conditions are favourable for growing grain crops, sugar beet, tobacco, and development of ochards/horticulture crops.

II This agro-climatic region is characterised by less precipitation compared to region I, longer period of snow coverage on heigher areas. The conditions are favourable for Grain growing, hoticulture and viticulture.

III The region has a lower level of precipitation compared to I and II: winter season is short, sometimes snowless, the frost period is short and the active vegetation period is the longest. Conditions are favourable for grain-growing, technical and food oil crops, hoticulture and viticulture

Agroclimatic regions			I	II	III
Soil warming at the depth	5 cm	+5°	24–29. III	17–24.III	14–19.III
		+10°	14–19.IV	11–14.IV	7–12.IV
		+15°	30.IV–5.V	27–30.IV	26–28.IV
	10 cm	+5°	23–31.III	19–25.III	15–21.III
		+10°	15–21.IV	12–18.IV	8–14.IV
		+15°	2–6.V	30.IV–2.V	28–30.IV
Period (days)	active vegetation		167–176	177–182	179–187
	frostless period		163–182	174–189	175–195

Масштаб 1:1 500 000

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H 11

PHENOLOGIC MAPS

SPRING

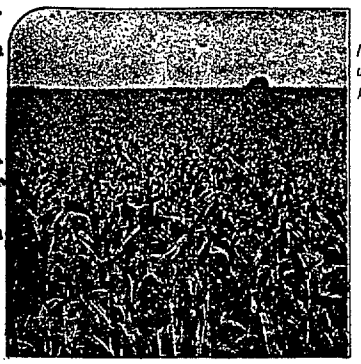
Bălți, Field Crops Inst. "Selecția"

v. Sirota, S-St. Comp. "Moldova"

ORHEI

Cahul Region

v. Gutuleț S-St. Comp. "Prietenia"



Поле кукурузы (колхоз им. Кирова Криулянского района)

Сад „Памяти Ильича" (Слободзейский район)

PHASES OF PLANTS DEVELOPMENT

- Swelling of buds in early-season grape varieties
- Beginning of apricot blossom
- Mass sun flower sprouting
- Beginning of apple-tree blossom
- Mass corn sprouting
- Mass winter wheet spiking

8.V The average dates of plant development phases

The average dates of the last late spring frosts on soil surface

earlier 20.IV 25.IV 30.IV 5.V later

15.IV in the air

Населенные пункты, к которым относятся данные по фазам развития растений

SUMMER

Bălți, Field Crops Institute

v. Sirota, S-St. Comp. "Moldova"

Cahul, v. Gutuleț

PHASES OF PLANTS DEVELOPMENT

- Beginning of early-season grape varieties blossom
- Mass spawning of corn whisk broom
- Apricot ripeness
- Mass corn milky ripening
- Sun flower ripening
- Early-season grape varieties ripening

15.VI The average dates of plant development phases

The average monthly temperature on the soil surface (in C)

lower 26 28 higher

AUTUMN

PHASES OF PLANTS DEVELOPMENT

- Apples ripeness
- Corn complete ripeness
- Grapes harvesting
- Mass winter wheet tillering
- Grape leaf shedding
- Apple tree leaf shedding

7.IX The average dates of plant development phases

The average dates of the first early fall frosts on soil surface

earlier 30.IX 5.X 10.X later

15.X in the air

SCALE 1 : 3 000 000

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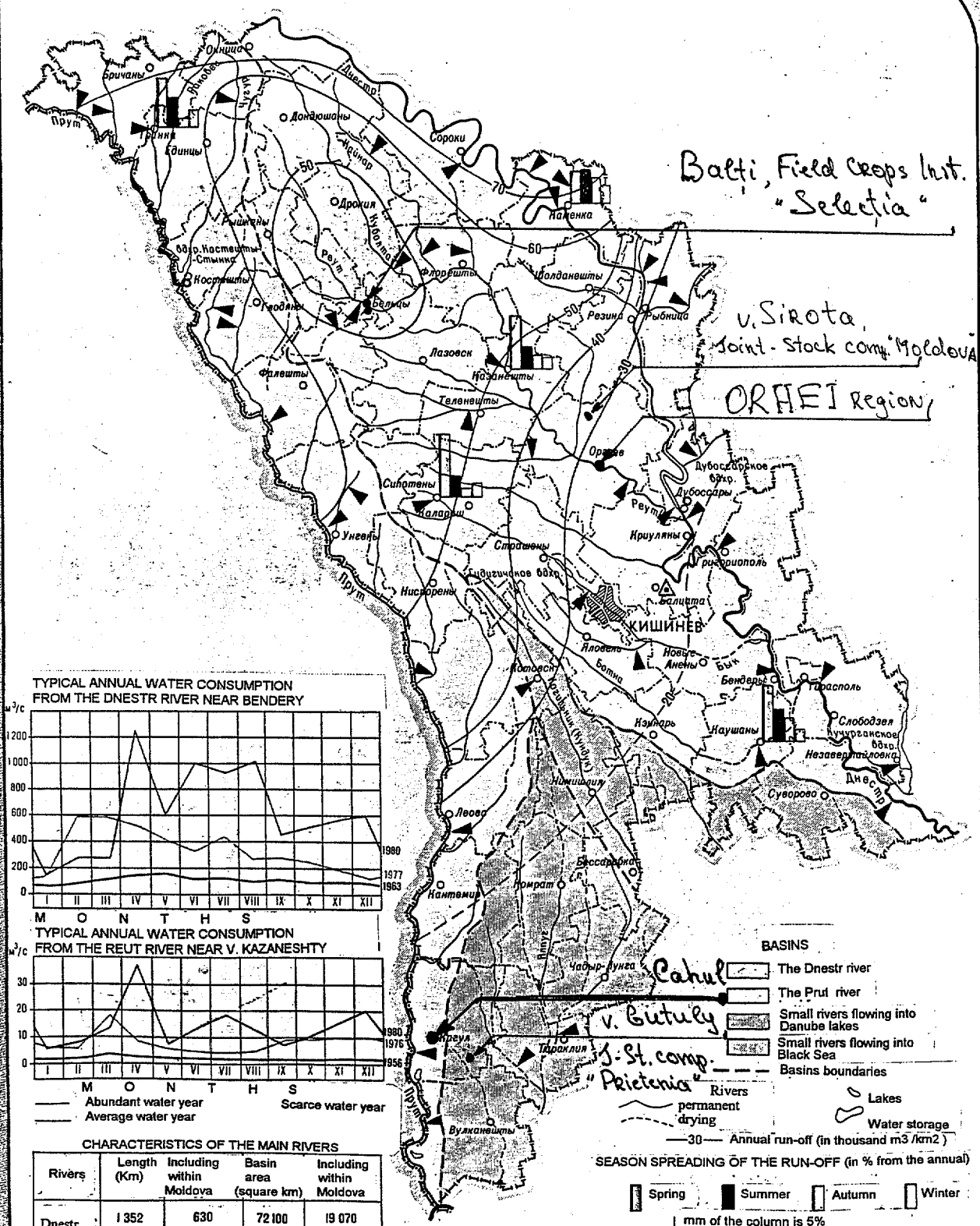
SURFACE WATERS



CHARACTERISTICS OF THE MAIN RIVERS

Rivers	Length (Km)	Including within Moldova	Basin area (square km)	Including within Moldova
Dnestr	1 352	630	72 100	19 070
Prut	967	695	27 500	7 990
Reut	286	286	7 760	7 760

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Масштаб 1 : 1 500 000

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Appendix I

Tables

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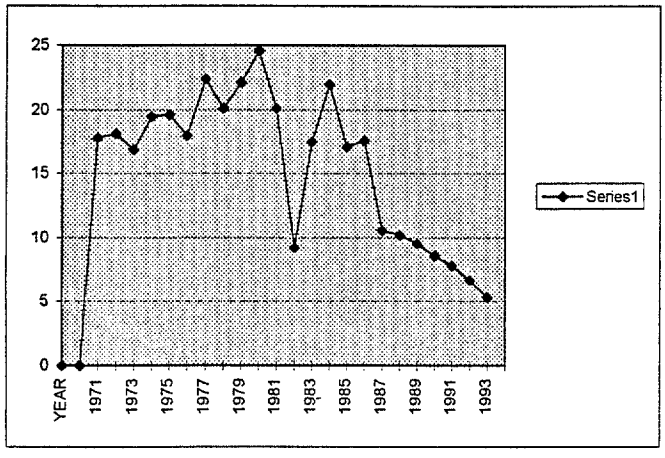
GENERAL USE OF PESTICIDES AND FERTILIZERS

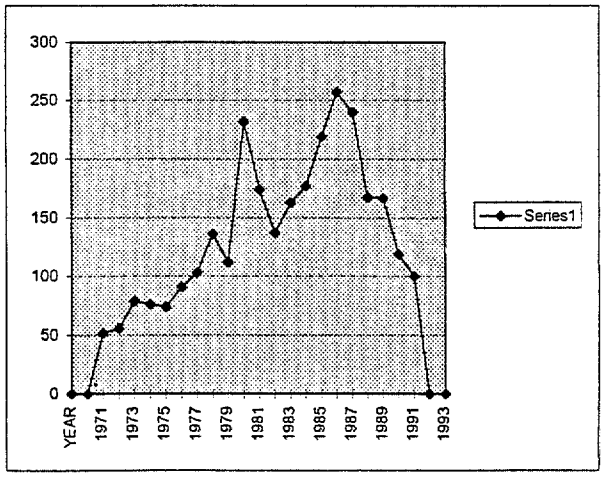
REGIONS OF CAHUL, ORHEI, AND BELTSY(based on Soroca data)

Quantity of active substance applied in kg/hectare

YEAR	CAHUL PESTICIDES
1971	17.8
1972	18.13
1973	16.84
1974	19.5
1975	19.61
1976	18
1977	22.44
1978	20.1
1979	22.15
1980	24.6
1981	20.1
1982	9.23
1983	17.5
1984	22.03
1985	17.1
1986	17.6
1987	10.6
1988	10.2
1989	9.53
1990	8.6
1991	7.84
1992	6.67
1993	5.34



YEAR	CAHUL FERTILIZERS
1971	52
1972	56
1973	79
1974	76
1975	74
1976	91
1977	103
1978	136
1979	112
1980	232
1981	174
1982	137
1983	163
1984	177
1985	219
1986	257
1987	240
1988	168
1989	167
1990	119
1991	100
1992	N.A.
1993	N.A.

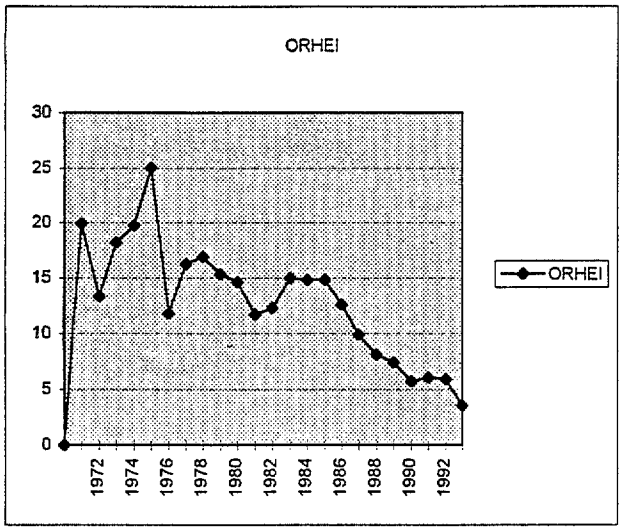


GENERAL USE OF PESTICIDES AND FERTILIZERS

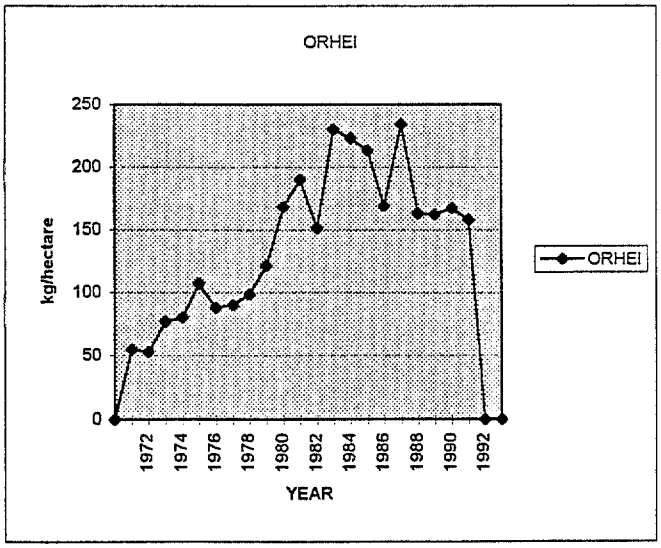
REGIONS OF CAHUL, ORHEI, AND BELTSY(based on Soroca data)

Quantity of active substance applied in kg/hectare

YEAR	ORHEI PESTICIDES
1971	19.91
1972	13.3
1973	18.2
1974	19.73
1975	25.05
1976	11.8
1977	16.2
1978	16.9
1979	15.34
1980	14.6
1981	11.7
1982	12.3
1983	15
1984	14.84
1985	14.8
1986	12.6
1987	9.9
1988	8.1
1989	7.4
1990	5.7
1991	6.08
1992	5.91
1993	3.52



YEAR	ORHEI FERTILIZERS
1971	55
1972	53
1973	77
1974	80
1975	107
1976	88
1977	90
1978	99
1979	121
1980	168
1981	190
1982	151
1983	230
1984	223
1985	213
1986	169
1987	234
1988	163
1989	162
1990	167
1991	158
1992	N.A.
1993	N.A.



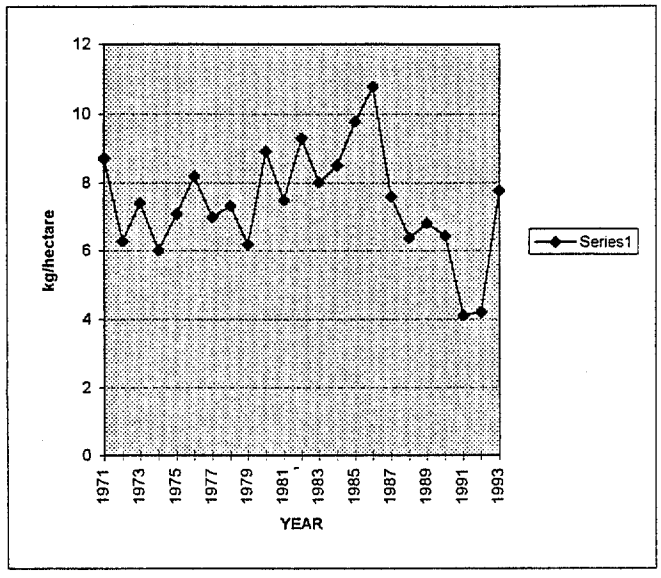
GENERAL USE OF PESTICIDES AND FERTILIZERS

REGIONS OF CAHUL, ORHEI, AND BELTSY(based on Soroca data)

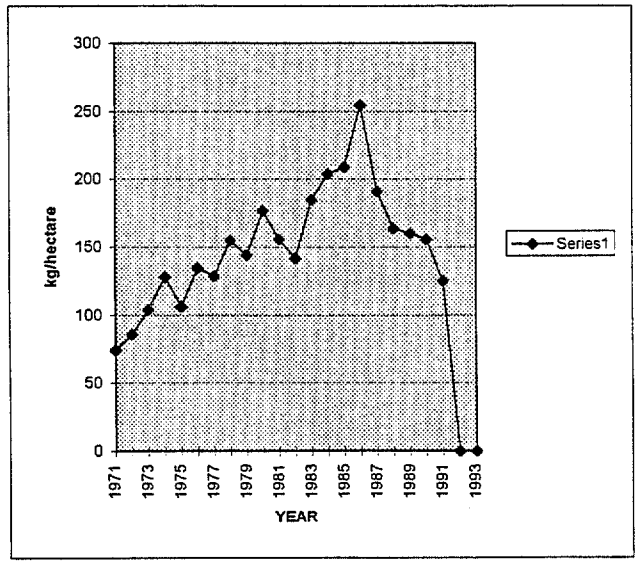
Quantity of active substance applied in kg/hectare

PESTICIDES

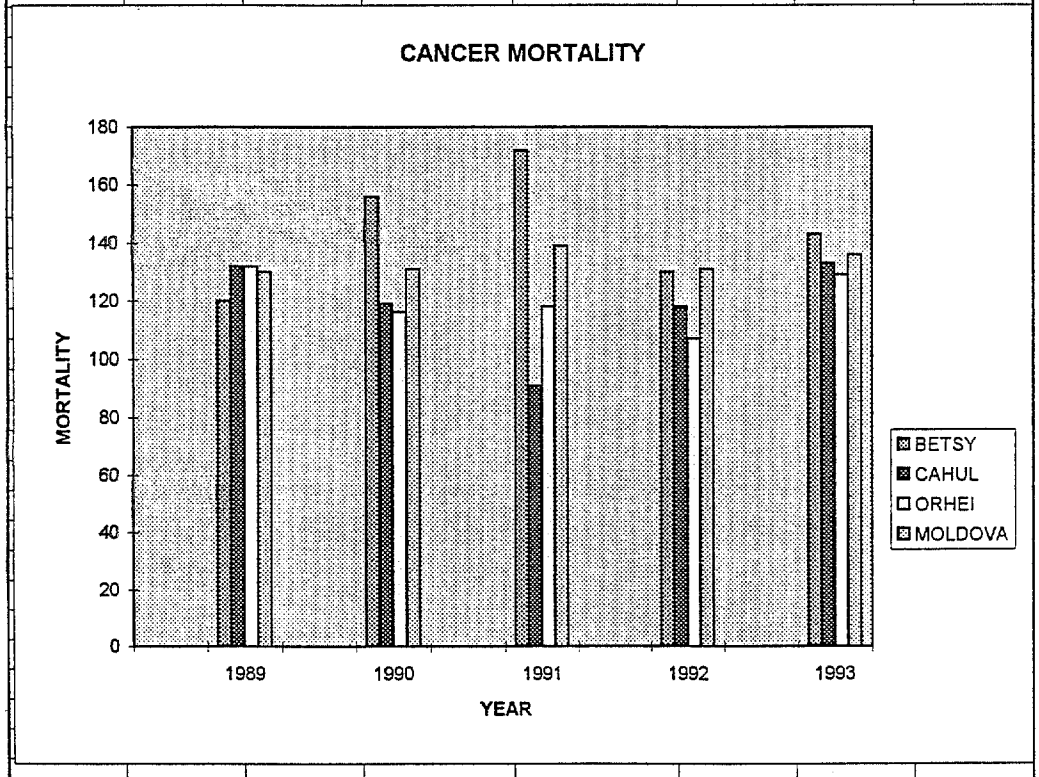
YEAR	BELTSY
1971	8.73
1972	6.3
1973	7.42
1974	6.03
1975	7.1
1976	8.2
1977	7
1978	7.33
1979	6.2
1980	8.93
1981	7.5
1982	9.3
1983	8.03
1984	8.52
1985	9.8
1986	10.8
1987	7.6
1988	6.4
1989	6.82
1990	6.45
1991	4.13
1992	4.21
1993	7.78



YEAR	BELTSY
	FERTILIZERS
1971	74
1972	86
1973	104
1974	128
1975	106
1976	135
1977	129
1978	155
1979	144
1980	177
1981	156
1982	142
1983	185
1984	204
1985	209
1986	255
1987	191
1988	164
1989	160
1990	156
1991	125
1992	N.A.
1993	N.A.



CANCER MORTALITY				
YEAR	BETSY	CAHUL	ORHEI	MOLDOVA
1989	120	132	132	130
1990	156	119	116	131
1991	172	91	118	139
1992	130	118	107	131
1993	143	133	129	136



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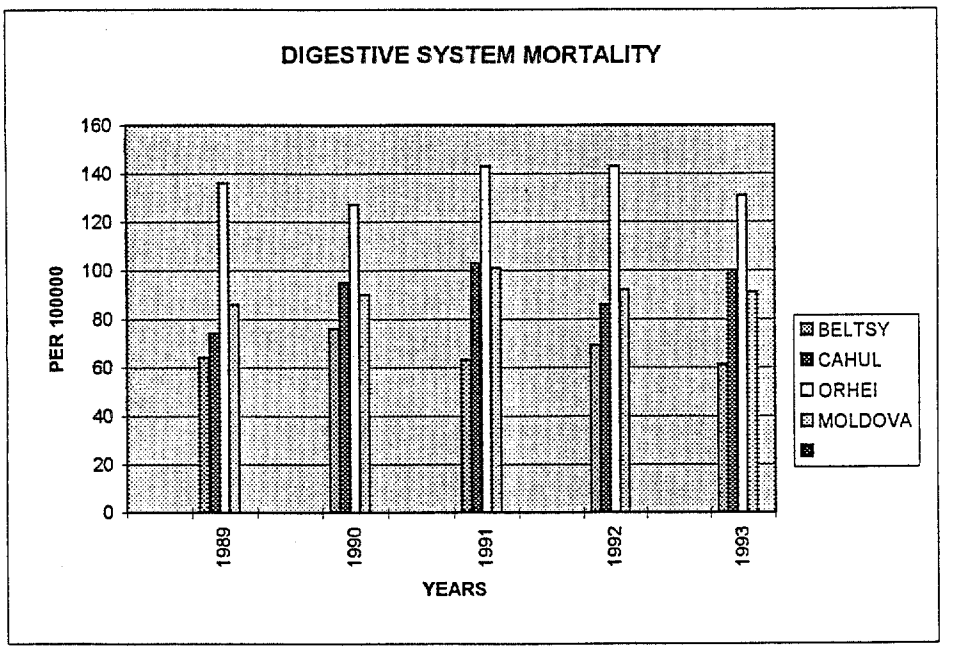
DIGESTIVE SYSTEM MORTALITY

YEAR	BELTSY	CAHUL	ORHEI	MOLDOVA average for republic
1989	64	74	136	86
1990	76	95	127	90
1991	63	103	143	101
1992	69	86	143	92
1993	61	100	131	91



CIRRHOSIS OF LIVER

YEAR	BETSY	CAHUL	ORHEI	MOLDOVA average for republic
1989	41	44	121	64
1990	50	56	104	68
1991	49	73	123	79
1992	46	66	122	70
1993	43	64	114	68

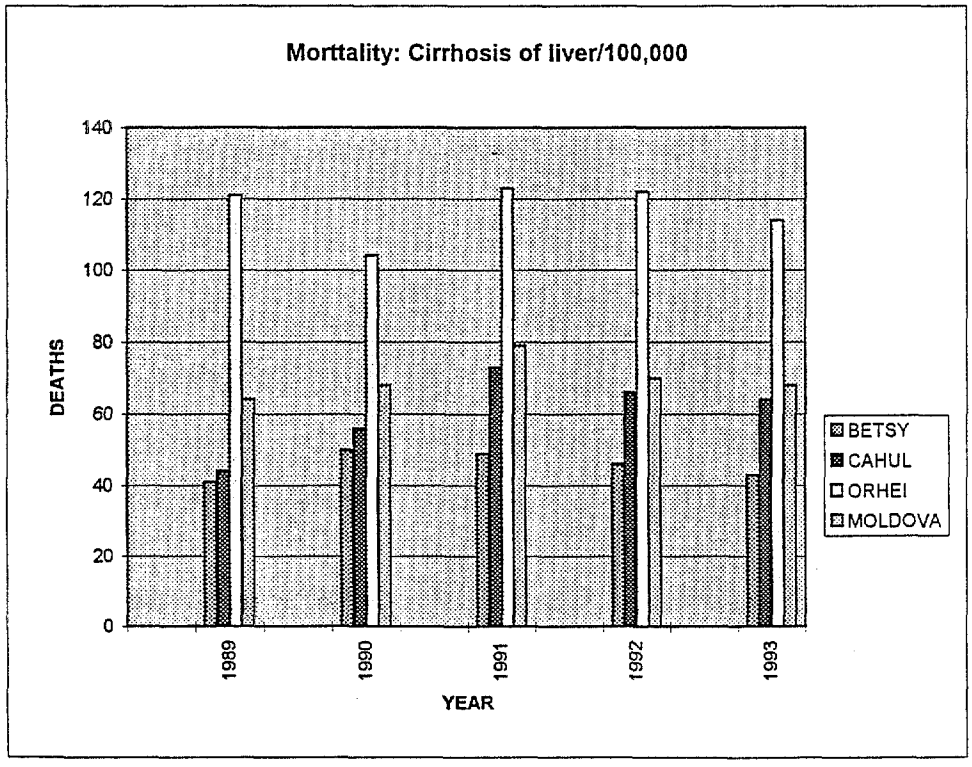


TABLE 7

CAHUL

ANALYTE	DEEP WELL #493 1995	DEEP WELL #410 1995	LEBENDENCO RESERVOIR 1995	HOSPITAL 1995
AMMONIUM	0.05	0.04	0.05	0.31
NITRATE	15	5.9	15.4	1.3
NITRITE	0.002	0	0.003	0
HARDNESS	6.5	7	10	1
DRY RESIDUE	811	722.4	574.4	623.6
CHLORINE	91.8	63.8	104	15.3
SULFATES	231.9	196.5	211.5	44
COPPER	0.005	0.004	0.006	0.005
IRON	0.02	0.03	0.02	0.03
MOLYBDENEM	0	0	0	0
ARSENIC	0	0.0012	0.0003	0
FLUORIDE	0.4	0.4	0.25	1.3
MANGANESE	0	0	0	0
HCO3				
COLIFORM				
ZINC	0.01	0.02	0.02	0.01
LEAD	0.01	0.004	0.006	0
BERYLIUM	0	0	0	0
STRONTIUM	0.5	0.5	0.5	0.2
PHOSPHATES				
a-HCCH				

TABLE 8

ORHEI

Results in units of mg/L or ppm

ANALYTE	DEEP DRILLED WELL #1 1994	DEEP DRILLED WELL #2 1991
AMMONIUM	0	0
NITRATE	0	1.55
NITRITE	3	
HARDNESS	150	170
DRY RESIDUE		
CHLORINE	33	42
SULFATES	304	414
COPPER	0.07	
IRON	0	0
MOLYBDENEM		
ARSENIC		
FLUORIDE	0.24	
MANGANESE		
HCO3	368	433
COLIFORM		
ZINC		
LEAD	0.0075	
ALUMINUM		
STRONTIUM	4.24	
PHOSPHATES	0.12	
a-HCCH	0.0048	

TABLE 9

CAHUL

ANALYTE	LEBENDENCO CWS	LEBENDENCO CAPTAGE	LEBENDENCO SHALLOW PRVT WELL	URSOAIA CWS	URSOAIA SHALLOW PRVT WELL	URSOAIA DEEP WELL	URSOAIA CAPTAGE
COPPER	0.03	0.01				0.01	0.03
NITRATE	3.9	2.9		57.9	87 - 446	44.5	50
NITRITE	0	0		0	0.03	0	0.002
SULFATE	70.1	126.4			172.7	71.3	104.7
AMMONIUM	0	0		0	0.1	0.03	0.09
CHLORIDE	66.2	19.5			149	88.3	91.5
COLLIFORM	93.00	111	111	93	333		

ORHEI

ANALYTE		SIROTA SHALLOW WELL	SIROTA DEEP WELLS	CUCURUZENI SHALLOW WELL	CUCURUZENI DEEP WELL
COPPER	1994				
	1995		0 - 0.2		0 - 0.1
NITRATE	1994	69 - 180			
	1995	6.3 - 58.5	0 - 10.2	16 - 162	0 - 8.1
NITRITE	1994				
	1995	0 - 0.14		0 - 0.0087	0.004 - 0.087
SULFATE	1994	82.3 - 1152.2	205.75 - 617.4		
	1995	493.8 - 864.2	246.9 - 288.05	452.6 - 1646	288. - 617.2
AMMONIUM	1994				
	1995	0 - 0.043		0 - 0.02	
CHLORIDE	1994	85.7 - 169.3	30.1 - 46.9		
	1995	91.1 - 215.6	28.7 - 34.8	44.5 - 173.4	32.2 - 80.3
COLLIFORM	1994	23			
	1995	23 - 230			

TABLE 10

ORHEI

RESULTS IN UNITS OF mg/L or PPM

ANALYTE	PRIVATE WELL 1994	PRIVATE WELL 1995	PRIVATE WELL 1994	PRIVATE WELL 1995	PRIVATE WELL 1994	PRIVATE WELL 1995	STREET WELL 1994	STREET WELL 1995	SPRING WATER WELL 1994	SPRING WATER WELL 1995	DEEP DRILLED WELL 1994	DEEP DRILLED WELL 1995	CAPTAGE - ORHEI 1994	CAPTAGE - ORHEI 1995	CWS ORHEI 1994	CWS ORHEI 1995
AMMONIUM	0.043	-	O.O43	0.1	0		0	0.08	0	0.6	0	2.9		0.06		0.11
NITRATE	81		81	58	81		69	51.3	0	1.7	1.5	1.6		0.01		0.01
NITRITE	0.14		0.14	0.01	0		0	0.01	0	0.01	0	0.01		44.9		3.9
HARDNESS	17.2		23.6	25.2	24		19.2	27.6	11.6	11.6	9.4	10.1		9.5		9
DRY RESIDUE	1700		3300	2123.8	3200		2750	2535.5	850	946	850	786.8		1122.4		966.2
CHLORINE	120.4		156.1	122.4	169.3		85.7	142.8	31.6	31.6	46.9	26.5		56.6		32.6
SULFATES	370.35		1152.2	916.2	305.3		823	1122.2	205.75	292.4	205.75	293		380.4		308.6
COPPER									0.06	0.06	0	0.206		0.004		0
IRON									8	0.49	0.25	0.77		0.07		0
MOLYBDENEM									0	0	0	0		0		0
ARSENIC									0	0.0003	0	0.0003		0		0
FLUORIDE				0.6				0.4	0.4	0.5	0.49	0.3		0.4		0.4
MANGANESE									0	0	0	0		0		
HCO3																
COLIFORM	<9		<9	N.T.	<9		<9		<3		<3			N.T.		
ZINC										0.02		0.02		0.02		
LEAD										0.01		0.01		0.01		
BERYLIUM										0		0		0		
STRONTIUM										5.95		4.85		0.7		